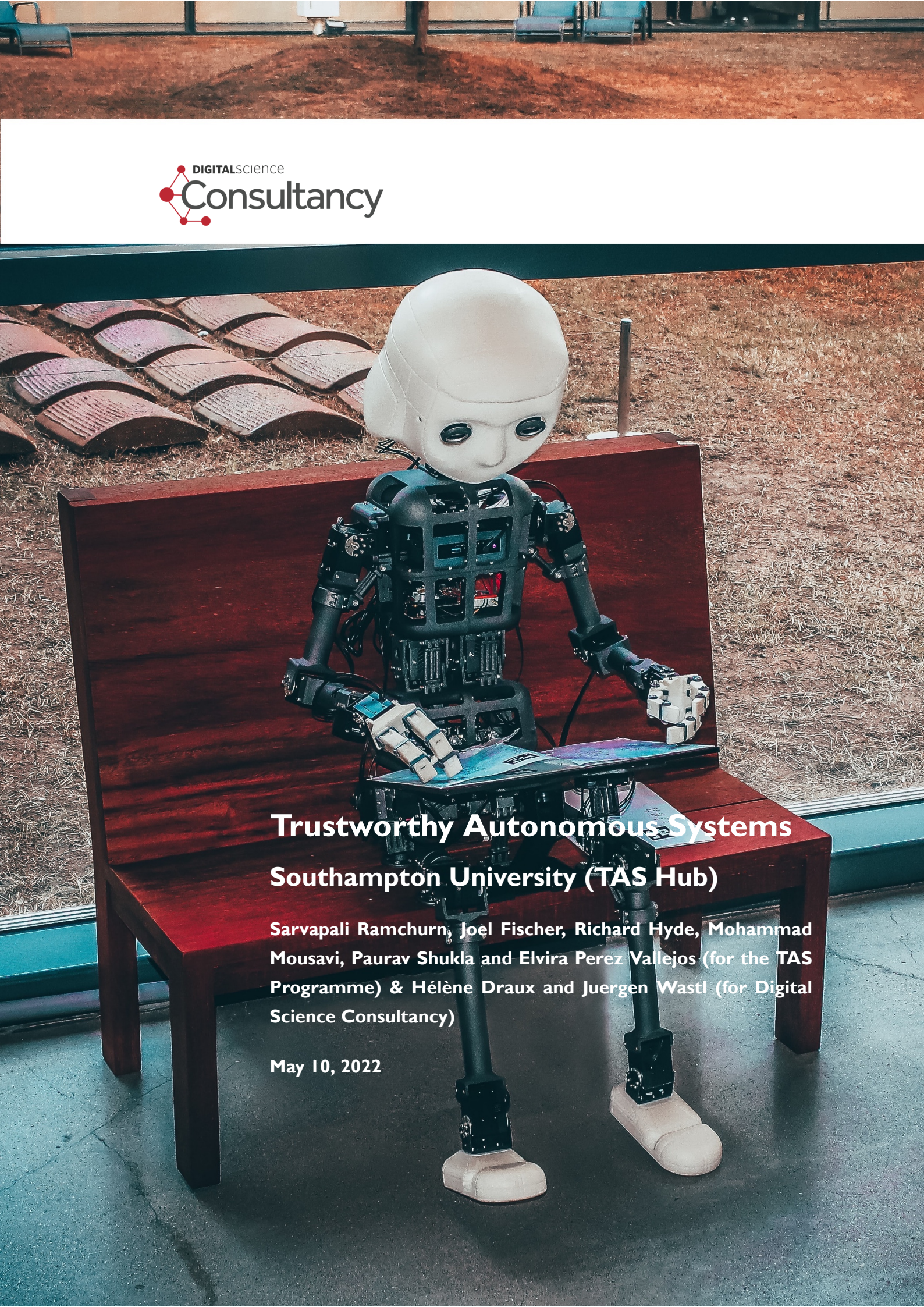

DIGITALscience Consultancy

Trustworthy Autonomous Systems

Southampton University (TAS Hub)

Sarvapali Ramchurn, Joel Fischer, Richard Hyde, Mohammad Mousavi, Paurav Shukla and Elvira Perez Vallejos (for the TAS Programme) & Hélène Draux and Juergen Wastl (for Digital Science Consultancy)

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Contributors

Sarvapali Ramchurn, Paurav Shukla
University of Southampton
Joel Fischer, Richard Hyde, Derek Mcauley, Elvira Perez Valejos
University of Nottingham
Mohammad Mousavi
King's College London

Contact

If you would like more information about this report, please email contact@tas.ac.uk

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Contents

Presentation of the work

UKRI and Southampton University are interested in a bibliometric analysis of Trustworthy Autonomous Systems (TAS) research in order to position the TAS Hub funded by the UKRI, in the UK and globally. The analysis aims to show the strengths and gaps in disciplines, suggest research to prioritise, find international similar programmes, and identify gaps in the expertise in the UK.

The work started first in collaboration with researchers on the TAS Programme with a selection of the keywords defining a range of fields that can encompass autonomous application of TAS:

- KL1: focuses on autonomous vehicles and their perceived risks
- KL2: robots, AI, and autonomous vehicles with a focus on verification and safety.
- KL3: digital health and mental health in ICT
- KL4: AI, data, and Autonomous Vehicles and their associated legal and governance and regulation
- KL5: AI, human-machine interaction, and smart systems and associated issues of fairness, explainability, ethics, and accountability
- KL6: Trust, responsible AI in systems involving multiple humans and machines and a range of interaction mechanisms

WP1 consisted of a bibliometric analysis of the data extracted, WP2 identified the gaps in TAS research compared to the UK, and WP3 identified the gaps in UK TAS research compared to global research.

1 Executive Summary

The UKRI Trustworthy Autonomous Systems Hub (TAS Hub) is the focal point of the £33m UKRI TAS Programme that involves six TAS Nodes (functionality, resilience, security, governance and regulation, verifiability, trust). One of the roles of the TAS Hub is to develop a multi-disciplinary community to address questions of trust in systems involving autonomous machines and artificial intelligence. Even though the TAS programme involves over 15 universities and 100 researchers, it cannot possibly involve all the researchers that are contributing to this research agenda. It is therefore crucial for the TAS programme to understand where and what the gaps exist in terms of disciplines and research areas in order to develop links with communities, researchers, and institutions that can fill these gaps and help develop a world-leading collaborative platform. To this end, through a procurement process, Digital Science (DS) Consultancy was contracted by the TAS Hub to carry out a landscape mapping exercise, using bibliometric analysis and keyword-based queries and guided by TAS Hub and Node researchers. The analyses carried out by the DS Consultancy team aimed to show both the strengths and the gaps in research fields, and to list the most prolific authors globally and in the UK.

The initial work carried out included first defining a set of appropriate keywords from TAS research across 2005-2019. A total of 239,898 global publications were identified (of which 15,680 - 6.8% of the total - were UK publications). Across all six keyword-based search sets the total number of publications increased from 6,521 in 2005 to 36,255 in 2019. This general trend reveals a dramatic growth in publications in all result sets and comparable growth areas (each area between 5- and 10-fold increase from 2005 to 2019).

The compound annual growth rate (CAGR) was calculated and revealed more growth in the last five years than in the last 15 years.

Results sets varied in citation rates (18.5 for the highest average citations.) The field citation ratio (FCR), which allows normalisation of subject differences, revealed that two of the results sets had the highest citation rates.

Publications were identified in the Dimensions database using Fields of Research (FoRs) for TAS Hub researchers (PIs and co-PIs). FoRs in selected publications revealed that just under half (46%) of publications authored by TAS researchers (from the Hub and the Nodes) were published in Information and Computing Sciences globally. Of these, 27.8% of publications were published by UK TAS researchers.

Gaps in TAS Hub research were identified and comparisons made between the UK overall and TAS Hub researchers revealing in what areas TAS Hub researchers publish more than UK researchers overall. Of the 22 FoRs there were just three fields in which UK researchers publish more than TAS Hub researchers.

Finally, a co-authorship network analysis was carried out across 2015-2019 where 10,567 co-authorship networks (aka communities) were revealed, with the largest made up of 629 researchers and the smallest made up of 11 researchers.

Gaps in the research communities were identified as those in the bottom ten communities identified with the lowest percentage of UK researchers. This resulted in a total of 3,309 publications, which were analysed looking at: i) top 3 FoRs; ii) top 10 most cited articles; and iii) top 10 most productive authors. The three most common FoRs were Technology, Medical and Health Sciences, and Psychology and Cognitive Sciences. The highest citation count in a publication was seen in Community18 with 378 citations. The most published global and UK authors were calculated and presented for the 10 communities least represented by UK researchers.

Through this exercise, we have thus developed a fundamental understanding of the key areas where the TAS community should focus its efforts in the next three years of the

programme. We expect these results to guide researchers in thinking about who they engage with and how they collaboratively develop their research within the Hub, Nodes, and beyond. These results also establish a baseline against which we can now measure progress in growing breadth and depth of the TAS research community.

2 WP1 - Subfield of TAS and their Fields of Research

For the period 2005 - 2019, there were 239,898 global publications in 6 subfields of TAS.

The UK had participated in 15,680 publications (6.5% of global publications).

Keywords used for the 6 subfields are as follow:

- **KL1** (((”Autonomous vehicles” OR AV OR ”Autonomous cars” OR ”Autonomous Automobiles”) AND Trust AND ((well-being OR wellbeing) OR Accessibility OR Control OR Decision making)) OR ((”Autonomous vehicles” OR AV OR ”Autonomous cars” OR ”Autonomous Automobiles”) AND Trust AND ((well-being OR wellbeing) AND (Inclusion OR Inclusivity))) OR ((”Autonomous vehicles” OR AV OR ”Autonomous cars” OR ”Autonomous Automobiles”) AND Trust AND (Control OR Risk)) OR (”Autonomous vehicles” AND trust) OR (”Autonomous vehicles” AND trust) OR (AV AND trust) OR (”Autonomous vehicles” AND control) OR (”Autonomous vehicles” AND Risk AND decision making) OR (AV AND Risk AND ”decision making”)) in the Fields of Research: (1503 Business and Management) OR (08 Information and Computing Sciences) OR (17 Psychology and Cognitive Sciences)
- **KL2** ((”Robots” OR ”Robot” OR ”Robotics” OR ”Robotic” OR ”Swarm” OR ”Swarms” OR ”Autonomous” OR ”Unmanned” OR ”UAV” OR ”UAVs” OR ”CAV” OR ”Automated Functions” OR ”Automated Driving” OR ”Drive Assist” OR ”Multi-Agent Systems” OR ”Multi-Agent System” OR ”Driverless” OR ”Self-Driving” OR ”ADAS”)

AND (”Testing” OR ”Validation” OR ”Verification” OR ”Verifying” OR ”Verifiably” OR ”Assurance” OR ”Assuring” OR ”Safety Case Analysis” OR ”Runtime Monitoring” OR ”Metaheuristics” OR ”Simulation” OR ”SMT Solving” OR ”SAT Solving” OR ”Constraint Solving” OR ”Model Checking” OR ”Search-Based”)) in Fields of Research (08 Information and Computing Sciences) OR (09 Engineering)

- **KL3** (”digital health technology” 2) OR (”digital mental health”) in any Fields of Research; (”mental health”) in Fields of Research (08 Information and Computing Sciences)

- **KL4** (”Autonomous System” AND ”Ethics”) OR (”Autonomous System” AND ”Liability”) OR (”Autonomous System” AND ”Data protection”) OR (”Artificial Intelligence” AND ”Law”) OR (”Artificial Intelligence” AND ”Regulation”) OR (”Artificial Intelligence” AND ”Governance”) OR (”Artificial Intelligence” AND ”Ethics”) OR (”Artificial Intelligence” AND ”Liability”) OR (”Artificial Intelligence” AND ”Data protection”) OR (”Artificial Intelligence” AND ”Risk”) OR (”Artificial Intelligence” AND ”Consumer Protection regulation”) OR (”Artificial Intelligence” AND ”Justice”) OR (”Artificial Intelligence” AND ”Accountability”) OR (”AI” AND ”Governance”) OR (”AI” AND ”Ethics”) OR (”AI” AND ”Liability”) OR (”AI” AND ”Justice”) OR (”AI” AND ”Accountability”) OR (”Automated Decision Making” AND ”Law”) OR (”Automated Decision Making” AND ”Regulation”) OR (”Automated Decision Making” AND ”Data protection”) OR (”Automated Decision Making” AND ”Justice”) OR (”Automated Decision Making” AND ”Accountability”) OR (”Autonomous Vehicle” AND ”Law”) OR (”Autonomous Vehicle” AND ”Regulation”) OR (”Autonomous Vehicle” AND ”Governance”) OR (”Autonomous Vehicle” AND ”Ethics”) OR (”Autonomous Vehicle” AND ”Liability”) OR (”Autonomous Vehicle” AND ”Data protection”) OR (”Autonomous Vehicle” AND ”Risk”) OR (”Autonomous Vehicle” AND ”Accountability”) OR (”Autonomous Car” AND ”Regulation”) OR (”Autonomous Car” AND ”Ethics”) OR (”Autonomous Car” AND ”Liability”) OR (”Machine learning” AND ”Governance”) OR (”Machine learning” AND ”Ethics”) OR (”Machine learning” AND ”Liability”) OR (”Machine learning” AND ”Data governance”) OR (”Machine learning” AND ”Justice”) OR (”Machine learning” AND ”Accountabil-

ity") OR ("Algorithm" AND "Governance") OR ("Algorithm" AND "Ethics") OR ("Algorithm" AND "Data protection") OR ("Algorithm" AND "Data governance") OR ("Algorithm" AND "Consumer Protection regulation") OR ("Algorithm" AND "Justice") OR ("Algorithm" AND "Accountability") OR ("Algorithmic" AND "Law") OR ("Algorithmic" AND "Regulation") OR ("Algorithmic" AND "Governance") OR ("Algorithmic" AND "Ethics") OR ("Algorithmic" AND "Liability") OR ("Algorithmic" AND "Data protection") OR ("Algorithmic" AND "Data governance") OR ("Algorithmic" AND "Risk") OR ("Algorithmic" AND "Consumer Protection regulation") OR ("Algorithmic" AND "Financial Services Regulation") OR ("Algorithmic" AND "Justice") OR ("Algorithmic" AND "Accountability") OR ("Data" AND "Ethics") OR ("Data" AND "Consumer Protection regulation") OR ("Data" AND "Financial Services Regulation") OR ("Data Protection" AND "Law") OR ("Data Protection" AND "Regulation") OR ("Data Protection" AND "Governance") OR ("Data Protection" AND "Ethics") OR ("Data Protection" AND "Liability") OR ("Data Protection" AND "Risk") OR ("Data Protection" AND "Consumer Protection regulation") OR ("Data Protection" AND "Financial Services Regulation") OR ("Data Protection" AND "Justice") OR ("Data Protection" AND "Accountability") excluding the Fields of Research ((06 Biological Sciences) OR (07 Agricultural and Veterinary Sciences) OR (08 Information and Computing Sciences) OR (11 Medical and Health Sciences) OR (1004 Medical Biotechnology))

- **KL5** ((fair OR fairness OR accountable OR accountability OR ethical OR ethics OR transparent OR transparency OR explainable OR intelligible OR interpretable OR legible OR unbiased OR debiased OR Trust OR Trustworthy OR responsible OR mixed-initiative OR human-in-the-loop) AND (Interaction OR "AI-driven system" OR "AI-infused system" OR "decision-making" OR "interactive system" OR "recommender system" OR "Autonomous system" OR "intelligent system" OR "Virtual Agent" OR "Software Agent" OR "multi-agent system" OR "human-robot interaction" OR "human-machine interaction" OR "human-machine teaming" OR "human-AI interaction" OR "human-computer interaction" OR "personal assistant" OR "autonomous vehicle" OR drone OR UAV OR "smart home" OR "machine learning" OR automation OR algorithm OR "connected devices" OR IOT OR "Internet of Things"

OR "smart speaker")) in the Fields of Research ((08 Information and Computing Sciences|09 Engineering) OR (17 Psychology and Cognitive Sciences) OR 18 Law and Legal Studies) OR 16 Studies in Human Society) OR (20 Language, Communication and Culture) OR (22 Philosophy and Religious Studies) OR (12 Built Environment and Design) OR (11 Medical and Health Sciences))

- **KL6** (("Responsible AI" OR "responsible Artificial intelligence") OR ("Explainable AI" OR "explainable artificial intelligence") OR (Explainability) OR ("Human-Machine Teaming" AND Trust) OR ("Human-AI interaction" AND Trust) OR ("Interpretable Machine Learning" OR "Interpretable ML") OR ("Adjustable Autonomy" OR "Flexible Autonomy") OR ("Human-Agent Interaction" AND Trust) OR ("Trust models") OR ("Human-Robot Interaction" AND Trust) OR ("Smart Homes" AND ("Artificial Intelligence" OR AI OR Agents) AND Trust) OR ("Smart cities" AND ("Artificial Intelligence" OR AI OR "Machine Learning" OR ML) AND Trust) OR (automated AND Trust AND Human) OR ("coalition formation" AND Trust) OR ("Agent-based Modelling" AND (Human OR Society) AND Trust) OR ("Smart Grids" AND ("Machine Learning" OR Human OR "Artificial Intelligence" OR AI OR ML) AND Trust) OR ("Smart cities" AND ("Artificial Intelligence" OR "Machine Learning" OR AI OR ML) AND Trust) OR (Auctions AND Trust) OR ("Game Theory" AND (Trust OR Reputation)) OR (("Human Computer Interaction" OR HCI) AND Trust)) excluding the Fields of Research ((07 Agricultural and Veterinary Sciences) OR (08 Information and Computing Sciences) OR (11 Medical and Health Sciences) OR (1004 Medical Biotechnology))

2.1 NUMBER OF ARTICLES PER YEAR

The number of publications in the field of TAS has gone from 6,521 in 2005 to 36,255 in 2019. Tables 2.1 and 2.2, and Figure 2.1 show the growth during these 15 years.

Table 2.1: Number of publications per year (2005-2012)

category	2005	2006	2007	2008	2009	2010	2011	2012
Total	6521	7619	8213	9501	10522	11424	12774	13762
KL5	3982	4355	4701	5229	5623	6169	6762	7288
KL2	2250	2901	3129	3834	4345	4610	5226	5748
KL4	257	311	334	385	461	554	705	655
KL1	39	61	48	68	70	57	66	95
KL6	44	63	68	85	125	116	120	105
KL3	20	27	22	28	27	40	40	45

Table 2.2: Number of publications per year (2013-2019)

category	2013	2014	2015	2016	2017	2018	2019	Total
Total	15430	16715	17973	20182	23646	29361	36255	239898
KL5	8031	8645	9352	10406	11822	14291	18055	124711
KL2	6627	7107	7551	8318	9906	12265	14647	98464
KL4	721	893	1023	1346	1831	2629	3244	15349
KL1	79	127	133	187	301	451	678	2460
KL6	117	122	110	132	145	222	328	1902
KL3	64	92	120	183	226	333	510	1777

Figure 2.1: Growth of publications in the 6 subfields of TAS between 2005 and 2019

2.2 NUMBER OF PUBLICATIONS IN TOP FOR CODES

The table on the page below shows the top 10 Fields of Research for each subfield of TAS. The missing values only indicates that these fields of research are not part of the top 10, not that there are no papers in them.

Table 2.3: Number of publication in the top 10 Fields of Research for each category

Fields of Research	KL1	KL4	KL6	KL3	KL5	KL2
0102 Applied Mathematics	167.0	-	-	-	-	4206.0
0104 Statistics	-	-	64.0	-	-	-
0801 Artificial Intelligence and Image Processing	2144.0	-	-	619.0	22094.0	69540.0
0802 Computation Theory and Mathematics	29.0	-	-	-	-	3138.0
0803 Computer Software	68.0	-	-	-	-	3332.0
0804 Data Format	25.0	-	-	-	-	-
0805 Distributed Computing	-	-	-	38.0	-	-
0806 Information Systems	215.0	-	-	616.0	15451.0	4810.0
0807 Library and Information Studies	-	-	-	110.0	-	-
0901 Aerospace Engineering	-	-	-	-	-	2061.0
0903 Biomedical Engineering	-	-	-	24.0	-	-
0905 Civil Engineering	28.0	-	-	-	-	-
0906 Electrical and Electronic Engineering	71.0	-	43.0	47.0	3881.0	9784.0
0910 Manufacturing Engineering	-	-	-	-	-	2638.0
0912 Materials Engineering	-	-	-	-	4784.0	-
0913 Mechanical Engineering	-	-	-	-	-	5573.0
1005 Communications Technologies	58.0	-	176.0	-	-	2126.0
1103 Clinical Sciences	-	-	-	57.0	9275.0	-
1109 Neurosciences	-	-	-	-	4345.0	-
1112 Oncology and Carcinogenesis	-	-	-	-	3637.0	-
1117 Public Health and Health Services	-	-	-	667.0	14434.0	-
1303 Specialist Studies in Education	-	902.0	-	-	-	-
1401 Economic Theory	-	-	102.0	-	-	-
1402 Applied Economics	-	471.0	120.0	-	-	-
1503 Business and Management	-	1123.0	126.0	-	-	-
1605 Policy and Administration	-	589.0	-	-	-	-
1606 Political Science	-	448.0	-	-	-	-
1608 Sociology	-	941.0	39.0	-	-	-
1701 Psychology	236.0	958.0	560.0	211.0	9568.0	-
1702 Cognitive Sciences	-	-	-	106.0	-	-
1801 Law	-	3566.0	47.0	-	-	-
2201 Applied Ethics	-	1181.0	-	-	-	-
2203 Philosophy	-	1269.0	39.0	-	4268.0	-

2.3 COMPOUND ANNUAL GROWTH RATE (CAGR)

On average, all publications of TAS grew slightly more in the last 5 years (cagr 15.1) than the last 15 years (cagr 12.1). KL1 grew the fastest in the last 5 years (38.5), near doubling its growth from the last 15 years (21.0)).

Table 2.4: Compound Annual Growth Rate (CAGR) (2005-2019)

category	CAGR 2005-19	CAGR 2015-19	Ratio
KL3	24.1	33.6	0.4
KL1	21.0	38.5	0.8
KL4	18.4	26.0	0.4
KL6	14.3	24.4	0.7
KL2	13.3	14.2	0.1
All subfields	12.1	15.1	0.2
KL5	10.6	14.1	0.3

2.4 AVERAGE CITATIONS AND FCR

The publications published in different fields of Research commonly receive a different number of citations; in some fields it is common to reach dozens or hundreds of citations, while it is less common in others. To compensate for this, we also used the Field Citation Ratio (FCR)[1] when looking at the average.

The subfield of KL5 had the highest average citations (18.5), but the subfield of KL3 and KL4 had the highest FCR (5.9), while KL2 had the lowest average FCR (3.4).

[1] Calculated by dividing the number of citations a paper has received by the average number received by documents published in the same year and in the same Fields of Research (FOR) category.

Table 2.5: Average citations and FCR

category	Average citations	Average FCR
KL5	18.5	5.1
KL6	16.1	5.3
KL3	14.3	5.9
KL1	11.8	4.4
KL2	10.8	3.4
KL4	9.3	5.9

2.5 TOP 10 HIGH PERFORMING ARTICLES: OVERALL

We present below the top 10 most performing articles published in 2005-2019; similar tables for the last two years are in the next section.

2.5.1 KL1

Table 2.6: Top 10 high performing articles (2005-2019) for KL1

doi	title	citations
10.1007/978-1-84800-015-5	Distributed Consensus in Multi-vehicle Cooperative Control, Theory and Applications	1306
10.1613/jair.2502	A Multiagent Approach to Autonomous Intersection Management	519
10.1109/wf-iot.2014.6803166	Internet of Vehicles: From Intelligent Grid to Autonomous Cars and Vehicular Clouds	465
10.1007/s10846-009-9383-1	A Survey of Motion Planning Algorithms from the Perspective of Autonomous UAV Guidance	432
10.1016/j.jesp.2014.01.005	The mind in the machine: Anthropomorphism increases trust in an autonomous vehicle	365

Continued on next page

Table 2.6 Continued: Top 10 high performing articles (2005-2019) for KL1

doi	title	citations
10.1109/tvt.2016.2555853	Path Planning and Tracking for Vehicle Collision Avoidance Based on Model Predictive Control With Multiconstraints	310
10.1177/0278364909340445	Planning Long Dynamically Feasible Maneuvers for Autonomous Vehicles	279
10.1007/978-3-642-03991-1	The DARPA Urban Challenge, Autonomous Vehicles in City Traffic	265
10.1080/10447318.2015.1070549	Investigating the Importance of Trust on Adopting an Autonomous Vehicle	264
10.1109/tro.2005.852260	Maneuver-Based Motion Planning for Nonlinear Systems With Symmetries	257

2.5.2 KL2

Table 2.7: Top 10 high performing articles (2005-2019) for KL2

doi	title	citations
10.1109/jproc.2006.887293	Consensus and Cooperation in Networked Multi-Agent Systems	6452
10.1016/j.asoc.2007.05.007	On the performance of artificial bee colony (ABC) algorithm	2237
10.1109/tevc.2009.2014613	JADE: Adaptive Differential Evolution with Optional External Archive	1904
10.1109/tsg.2010.2089069	Autonomous Demand-Side Management Based on Game-Theoretic Energy Consumption Scheduling for the Future Smart Grid	1879
10.1109/tpel.2006.890003	Modeling, Analysis and Testing of Autonomous Operation of an Inverter-Based Microgrid	1654
10.1016/j.ecolmodel.2006.04.023	A standard protocol for describing individual-based and agent-based models	1636
10.1145/2049662.2049663	The university of Florida sparse matrix collection	1476
10.1016/j.automatica.2005.07.001	Continuous finite-time control for robotic manipulators with terminal sliding mode	1439
10.1002/adfm.201504755	Stretchable, Skin□Mountable, and Wearable Strain Sensors and Their Potential Applications: A Review	1369
10.1007/978-1-84800-015-5	Distributed Consensus in Multi-vehicle Cooperative Control, Theory and Applications	1306

2.5.3 KL3

Table 2.8: Top 10 high performing articles (2005-2019) for KL3

doi	title	citations
10.1016/j.chb.2015.12.045	Relationships among smartphone addiction, stress, academic performance, and satisfaction with life	412
10.1016/j.chb.2013.10.049	The relationship between cell phone use, academic performance, anxiety, and Satisfaction with Life in college students	393
10.1111/j.1083-6101.2008.00428.x	Who plays, how much, and why? Debunking the stereotypical gamer profile	386
10.4258/hir.2016.22.3.156	Medical Internet of Things and Big Data in Healthcare	374
10.1089/cyber.2010.0260	Problematic Video Game Use: Estimated Prevalence and Associations with Mental and Physical Health	288
10.1016/j.chb.2016.05.079	Fear of missing out, need for touch, anxiety and depression are related to problematic smartphone use	285
10.1057/sth.2013.10	The digitally engaged patient: Self-monitoring and self-care in the digital health era	284
10.1016/j.chb.2014.04.043	It's only a computer: Virtual humans increase willingness to disclose	272
10.1089/cpb.2007.9992	Factors Predictive for Incidence and Remission of Internet Addiction in Young Adolescents A Prospective Study	265
10.1016/j.specom.2015.03.004	A review of depression and suicide risk assessment using speech analysis	248

2.5.4 KL4

Table 2.9: Top 10 high performing articles (2005-2019) for KL4

doi	title	citations
10.1016/j.tra.2015.04.003	Preparing a nation for autonomous vehicles: opportunities, barriers and policy recommendations	1203
10.1126/science.1165893	Distilling Free-Form Natural Laws from Experimental Data	1019
10.4135/9781412963909	The SAGE Encyclopedia of Qualitative Research Methods	973
10.1109/tnn.2004.839354	Neural Network-Based Adaptive Dynamic Surface Control for a Class of Uncertain Nonlinear Systems in Strict-Feedback Form	904

Continued on next page

Table 2.9 Continued: Top 10 high performing articles (2005-2019) for KL4

doi	title	citations
10.1037/a0017103	Bad Apples, Bad Cases, and Bad Barrels: Meta-Analytic Evidence About Sources of Unethical Decisions at Work	820
10.1007/978-3-642-13959-8	Uncertainty Theory, A Branch of Mathematics for Modeling Human Uncertainty	667
10.1109/tac.2007.902731	Trajectory-Tracking and Path-Following of Underactuated Autonomous Vehicles With Parametric Modeling Uncertainty	569
10.1073/pnas.1222469111	Coastal flood damage and adaptation costs under 21st century sea-level rise	568
10.1037/0021-9010.93.2.374	Moral Disengagement in Ethical Decision Making: A Study of Antecedents and Outcomes	567
10.2139/ssrn.2477899	Big Data's Disparate Impact	540

2.5.5 KL5

Table 2.10: Top 10 high performing articles (2005-2019) for KL5

doi	title	citations
10.1021/ct700301q	GROMACS 4: Algorithms for Highly Efficient, Load-Balanced, and Scalable Molecular Simulation	11037
10.1136/bmj.g7647	Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation	5041
10.1017/s0140525x0999152x	The weirdest people in the world?	4710
10.1038/nnano.2008.215	High-yield production of graphene by liquid-phase exfoliation of graphite	4383
10.1161/str.0b013e318284056a	Guidelines for the Early Management of Patients With Acute Ischemic Stroke	3567
10.1016/j.neuroimage.2008.03.061	Threshold-free cluster enhancement: Addressing problems of smoothing, threshold dependence and localisation in cluster inference	3273
10.1038/nrn1824	Astrocyte–endothelial interactions at the blood–brain barrier	3240
10.1063/1.2836410	Multiferroic magnetoelectric composites: Historical perspective, status, and future directions	2777
10.1186/gb-2010-11-8-r86	Galaxy: a comprehensive approach for supporting accessible, reproducible, and transparent computational research in the life sciences	2708
10.1038/nrn1884	Meeting of minds: the medial frontal cortex and social cognition	2701

2.5.6 KL6

Table 2.11: Top 10 high performing articles (2005-2019) for KL6

doi	title	citations
10.1016/j.biosystems.2009.10.003	Coevolutionary games—A mini review	1308
10.1038/nature04605	A simple rule for the evolution of cooperation on graphs and social networks	1272
10.1111/j.1468-0262.2006.00719.x	Promises and Partnership	775
10.1126/science.1189047	The Neuropeptide Oxytocin Regulates Parochial Altruism in Intergroup Conflict Among Humans	675
10.1177/0018720811417254	A Meta-Analysis of Factors Affecting Trust in Human-Robot Interaction	636
10.1037/0022-3514.92.1.56	Social Exclusion Decreases Prosocial Behavior	621
10.1016/j.artint.2018.07.007	Explanation in artificial intelligence: Insights from the social sciences	567
10.1177/0018720814547570	Trust in Automation	559
10.1177/0018720810376055	Complacency and Bias in Human Use of Automation: An Attentional Integration	438
10.1146/annurev.psych.121208.131647	The Neuroscience of Social Decision-Making	425

2.6 TOP 10 HIGH PERFORMING ARTICLES: LAST 2 YEARS

Similar to the previous section, but for the last 2 years, we present the top 10 most performing articles.

2.6.1 KL1

Table 2.12: Top 10 high performing articles (2018-2019) for KL1

doi	title	citations
10.1016/j.trc.2018.02.005	Dissipation of stop-and-go waves via control of autonomous vehicles: Field experiments	183
10.1146/annurev-control-060117-105157	Planning and Decision-Making for Autonomous Vehicles	173
10.1016/j.trc.2018.11.018	The roles of initial trust and perceived risk in public's acceptance of automated vehicles	126
10.1109/comst.2018.2888904	Networking and Communications in Autonomous Driving: A Survey	122
10.1016/j.trc.2018.07.024	What drives people to accept automated vehicles? Findings from a field experiment	114
10.1109/iccps.2018.00035	Autoware on Board: Enabling Autonomous Vehicles with Embedded Systems	103
10.1016/j.trc.2018.08.013	An empirical investigation on consumers' intentions towards autonomous driving	99
10.1016/j.aap.2018.12.019	Evaluating the safety impact of connected and autonomous vehicles on motorways	83
10.1016/j.trc.2018.05.003	Dynamic autonomous vehicle fleet operations: Optimization-based strategies to assign AVs to immediate traveler demand requests	78
10.1109/tvt.2018.2822762	Humanlike Driving: Empirical Decision-Making System for Autonomous Vehicles	77

2.6.2 KL2

Table 2.13: Top 10 high performing articles (2018-2019) for Keywords_List_2

doi	title	citations
10.1109/twc.2017.2789293	Joint Trajectory and Communication Design for Multi-UAV Enabled Wireless Networks	622
10.1109/jsac.2018.2815360	Task Offloading for Mobile Edge Computing in Software Defined Ultra-Dense Network	388
10.1145/3180155.3180220	DeepTest	291

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Table 2.13 Continued: Top 10 high performing articles (2018-2019) for Keywords_List_2

doi	title	citations
10.1016/j.autcon.2017.12.001	Tunnel structural inspection and assessment using an autonomous robotic system	262
10.1016/j.jocs.2017.07.018	A new feature selection method to improve the document clustering using particle swarm optimization algorithm	261
10.1109/jsac.2018.2864426	Computation Rate Maximization in UAV-Enabled Wireless-Powered Mobile-Edge Computing Systems	246
10.1109/mcom.2018.1700643	The Sky is not the Limit: LTE for Unmanned Aerial Vehicles	243
10.1371/journal.pcbi.1006223	OpenSim: Simulating musculoskeletal dynamics and neuromuscular control to study human and animal movement	226
10.1126/sciadv.aat0098	MXenes stretch hydrogel sensor performance to new limits	220
10.1109/icra.2018.8460528	Sim-to-Real Transfer of Robotic Control with Dynamics Randomization	219

2.6.3 KL3

Table 2.14: Top 10 high performing articles (2018-2019) for KL3

doi	title	citations
10.1056/nejmsr1809937	The "All of Us" Research Program	205
10.1002/wps.20592	Towards a consensus around standards for smartphone apps and digital mental health	126
10.1089/cyber.2017.29099.gri	Neuroscience of Virtual Reality: From Virtual Exposure to Embodied Medicine	125
10.1016/j.envint.2019.02.013	Using deep learning to examine street view green and blue spaces and their associations with geriatric depression in Beijing, China	109
10.1177/1178222618792860	Natural Language Processing of Social Media as Screening for Suicide Risk	100
10.1371/journal.pmed.1002595	Adherence interventions and outcomes of tuberculosis treatment: A systematic review and meta-analysis of trials and observational studies	84

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Table 2.14 Continued: Top 10 high performing articles (2018-2019) for KL3

doi	title	citations
10.3390/s19092164	Smartphone Sensors for Health Monitoring and Diagnosis	80
10.1001/jamapsychiatry.2017.3838	A Solution-Focused Research Approach to Achieve an Implementable Revolution in Digital Mental Health	78
10.1089/cyber.2017.0668	Passive and Active Social Media Use and Depressive Symptoms Among United States Adults	75
10.2196/12869	Digital Mental Health Interventions for Depression, Anxiety, and Enhancement of Psychological Well-Being Among College Students: Systematic Review	74

2.6.4 KL4

Table 2.15: Top 10 high performing articles (2018-2019) for KL4

doi	title	citations
10.1016/j.bushor.2018.08.004	Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence	329
10.1038/s42256-019-0088-2	The global landscape of AI ethics guidelines	286
10.1016/j.ssci.2017.10.001	Perceptions of autonomous vehicles: Relationships with road users, risk, gender and age	200
10.1016/j.techfore.2017.12.016	Green innovation and organizational performance: The influence of big data and the moderating role of management commitment and HR practices	186
10.1016/j.cities.2019.01.032	On big data, artificial intelligence and smart cities	170
10.1016/j.jik.2017.06.002	Relationship between innovation capability, innovation type, and firm performance	167
10.1038/d41586-018-05707-8	AI can be sexist and racist — it's time to make it fair	162
10.1007/s11747-019-00696-0	How artificial intelligence will change the future of marketing	155
10.1111/bjop.12290	Why and how to use virtual reality to study human social interaction: The challenges of exploring a new research landscape	147

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Table 2.15 Continued: Top 10 high performing articles (2018-2019) for KL4

doi	title	citations
10.1145/3194770.3194776	Fairness definitions explained	136

2.6.5 KL5

Table 2.16: Top 10 high performing articles (2018-2019) for KL5

doi	title	citations
10.1093/nar/gky310	MetaboAnalyst 4.0: towards more transparent and integrative metabolomics analysis	1862
10.1038/s41591-018-0300-7	High-performance medicine: the convergence of human and artificial intelligence	1106
10.1016/j.cell.2018.02.010	Identifying Medical Diagnoses and Treatable Diseases by Image-Based Deep Learning.	1062
10.1186/s12874-018-0611-x	Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach	1009
10.1109/twc.2017.2789293	Joint Trajectory and Communication Design for Multi-UAV Enabled Wireless Networks	622
10.1038/s42256-019-0048-x	Stop explaining black box machine learning models for high stakes decisions and use interpretable models instead	603
10.1016/j.artint.2018.07.007	Explanation in artificial intelligence: Insights from the social sciences	567
10.1016/j.future.2018.05.046	On blockchain and its integration with IoT. Challenges and opportunities	539
10.1016/j.rser.2018.10.014	Blockchain technology in the energy sector: A systematic review of challenges and opportunities	515
10.1016/j.ijinfomgt.2017.12.0051	Blockchain's roles in meeting key supply chain management objectives	455

2.6.6 KL6

Table 2.17: Top 10 high performing articles (2018-2019) for Keywords_List_6

doi	title	citations
10.1016/j.artint.2018.07.007	Explanation in artificial intelligence: Insights from the social sciences	567
10.1631/fitee.1700808	Visual interpretability for deep learning: a survey	228
10.1145/3290605.3300831	Designing Theory-Driven User-Centric Explainable AI	109
10.1002/hast.973	Artificial Intelligence and Black□Box Medical Decisions: Accuracy versus Explainability	89
10.21105/joss.00786	iml: An R package for Interpretable Machine Learning	82
10.1016/j.techfore.2017.10.005	The future and social impact of Big Data Analytics in Supply Chain Management: Results from a Delphi study	78
10.1007/s11747-019-00710-5	Explainable AI: from black box to glass box	75
10.1111/risa.13143	Public Acceptance of Fully Automated Driving: Effects of Social Trust and Risk/Benefit Perceptions	74
10.1016/j.aap.2018.03.021	Psychosocial factors associated with intended use of automated vehicles: A simulated driving study	72
10.1145/3290605.3300705	What Makes a Good Conversation?	57

3 WP2 - TAS Hub gaps compared to the UK

We compared the Fields of Research (FOR) for TAS Hub researchers and the UK researchers, using the set of publications created during WP0.

3.1 TAS HUB RESEARCHERS

We identified TAS Hub researchers (PIs and Co-PIs) in Dimensions - either their Dimensions profile or, as accurately as possible, their list of publications. We used the machine learnt FOR of their publications to identify the FOR distribution of the TAS Hub researchers. Table 3.1 shows the number of publications for the TAS Hub researchers in each Field of Research, with the percentage of publications of the corpus it represents.

Nearly half (46.1%) of publications by TAS Hub researchers, for instance, were published in 08 Information and Computing Sciences.

Table 3.1: Number of publications for the TAS Hub researchers in each field of research (2-digit)

Field of Research	Number of publications	Percentage
01 Mathematical Sciences	529	5.0
02 Physical Sciences	69	0.6
03 Chemical Sciences	85	0.8

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Table 3.1 Continued: Number of publications for the TAS Hub researchers in each field of research (2-digit)

Field of Research	Number of publications	Percentage
04 Earth Sciences	26	0.2
05 Environmental Sciences	20	0.2
06 Biological Sciences	145	1.4
07 Agricultural and Veterinary Sciences	6	0.1
08 Information and Computing Sciences	4926	46.2
09 Engineering	945	8.9
10 Technology	330	3.1
11 Medical and Health Sciences	1630	15.3
12 Built Environment and Design	79	0.7
13 Education	106	1.0
14 Economics	61	0.6
15 Commerce, Management, Tourism and Services	139	1.3
16 Studies in Human Society	174	1.6
17 Psychology and Cognitive Sciences	907	8.5
18 Law and Legal Studies	110	1.0
19 Studies in Creative Arts and Writing	35	0.3
20 Language, Communication and Culture	179	1.7
21 History and Archaeology	40	0.4
22 Philosophy and Religious Studies	126	1.2

3.2 UK RESEARCHERS

Publications by UK researchers were defined as publications where at least one of the authors had at least one affiliation in the UK.

For UK researchers, only 27.8% of TAS research is categorised as 08 Information and Computing Sciences, while 27.6% of TAS research is in 11 Medical and Health Sciences.

Table 3.2: Number of publications for UK researchers in each field of research (2-digit)

Field of Research	Number of publications	Percentage
01 Mathematical Sciences	445	2.3
02 Physical Sciences	199	1.0
03 Chemical Sciences	136	0.7
04 Earth Sciences	75	0.4
05 Environmental Sciences	62	0.3
06 Biological Sciences	435	2.2
07 Agricultural and Veterinary Sciences	35	0.2
08 Information and Computing Sciences	5372	27.8
09 Engineering	2178	11.3
10 Technology	313	1.6
11 Medical and Health Sciences	5341	27.6
12 Built Environment and Design	134	0.7
13 Education	141	0.7
14 Economics	195	1.0
15 Commerce, Management, Tourism and Services	338	1.7
16 Studies in Human Society	1180	6.1
17 Psychology and Cognitive Sciences	1218	6.3
18 Law and Legal Studies	587	3.0
19 Studies in Creative Arts and Writing	29	0.1
20 Language, Communication and Culture	213	1.1
21 History and Archaeology	44	0.2
22 Philosophy and Religious Studies	665	3.4

3.3 IDENTIFYING GAPS - COMPARISON TAS HUB WITH UK RESEARCHERS

We compared the distribution of Fields of Research for the TAS Hub researchers and the UK researchers. At the top of the table, and any ratio above 1, are the over-represented fields of research, where TAS Hub researchers publish more than the UK researchers; while at the bottom are gaps in TAS Hub researchers compared to UK researchers.

Table 3.3: Comparison of publications for TAS Hub and UK researchers in each field of research (2-digit)

Field of Research	Percentage (TAS Hub)	Percentage (UK)	Ratio (TAS/UK)
19 Studies in Creative Arts and Writing	0.3	0.1	3.0
01 Mathematical Sciences	5.0	2.3	2.2
21 History and Archaeology	0.4	0.2	2.0
10 Technology	3.1	1.6	1.9
08 Information and Computing Sciences	46.2	27.8	1.7
20 Language, Communication and Culture	1.7	1.1	1.5
13 Education	1.0	0.7	1.4
17 Psychology and Cognitive Sciences	8.5	6.3	1.3
03 Chemical Sciences	0.8	0.7	1.1
12 Built Environment and Design	0.7	0.7	1.0
09 Engineering	8.9	11.3	0.8
15 Commerce, Management, Tourism and Services	1.3	1.7	0.8
05 Environmental Sciences	0.2	0.3	0.7
11 Medical and Health Sciences	15.3	27.6	0.6
02 Physical Sciences	0.6	1.0	0.6
14 Economics	0.6	1.0	0.6
06 Biological Sciences	1.4	2.2	0.6
07 Agricultural and Veterinary Sciences	0.1	0.2	0.5
04 Earth Sciences	0.2	0.4	0.5
22 Philosophy and Religious Studies	1.2	3.4	0.4
16 Studies in Human Society	1.6	6.1	0.3
18 Law and Legal Studies	1.0	3.0	0.3

4 WP3 - UK Gaps in TAS research

4.1 CO-AUTHORSHIP NETWORK

For this analysis, we have now reduced the time-frame to 5 years: 2015 to 2019, and performed a co-authorship network analysis.

We used the 127,417 publications that had identified researchers, created a co-authorship network, and kept only branches were authors had co-authored at least 2 publications in our corpus. We then used the Leiden algorithm to identify communities.

Using the titles of the publications in these communities, we associated each community with the 10 most frequent terms used in the titles; excluding stop words and common terms in titles.

We obtained 10,567 communities, the largest was made of 629 researchers and an average of 11 researchers. The table below shows the 33 largest (> 100 global researchers) communities - each community has been given a random number.

Table 4.1: Largest communities of global researchers

community	Number of UK researchers	Number of global researchers	Percentage of UK researchers	Top 10 most frequent words in titles
15	163	194	84.0	research integrity research integrity world proceedings 4th conference proceedings 4th 4th world world conference
32	93	113	82.3	algorithmic data accountability human decision making decision making internet model things
7	182	261	69.7	robot autonomous robots verification human systems vehicles based robotic trust
13	121	226	53.5	autonomous control vehicles based vehicle autonomous vehicles driving path tracking automated
12	97	231	42.0	robot soft based control robots model robotic simulation arm autonomous
8	95	259	36.7	uav networks based allocation resource wireless power enabled systems resource allocation
22	48	149	32.2	robot control based robots robotic locomotion humanoid time walking design
11	61	246	24.8	based networks uav data trust multi learning model blockchain communication
28	21	120	17.5	based design systems mobile control robot data computing trust dynamic
0	99	629	15.7	control based robot multi systems adaptive robots time aerial robotic
5	41	282	14.5	robot control based planning learning humanoid robots robotic multi motion
29	17	117	14.5	based social trust algorithm networks search swarm system network data
9	37	258	14.3	robot autonomous control multi based planning driving systems robots multi robot
23	20	143	14.0	based energy smart robot system data control management optimization multi
10	34	249	13.7	control based robot multi robotic cooperative tracking planning aerial vehicles
14	28	216	13.0	2017 global countries burden global burden 195 territories 195 countries countries territories 2015
3	34	300	11.3	learning robot based robotic deep human control multi planning real
16	19	193	9.8	control multi based systems robot agent multi agent planning agent systems distributed
25	11	133	8.3	networks based uav multi power trajectory mobile allocation computing data
6	18	272	6.6	control multi systems agent multi agent agent systems consensus based time distributed
20	10	160	6.2	control systems multi agent multi agent agent systems based adaptive consensus nonlinear
4	18	298	6.0	control robot based robots multi autonomous mobile planning vehicles adaptive

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Table 4.1 Continued: Largest communities of global researchers

community	Number of UK researchers	Number of global researchers	Percentage of UK researchers	Top 10 most frequent words in titles
17	9	177	5.1	trust human agent robot control automation transparency autonomous systems based
27	6	124	4.8	diabetes control loop closed closed loop type type diabetes glucose artificial pancreas
2	14	325	4.3	robot control based planning autonomous vehicles multi aerial robots unmanned
18	7	169	4.1	based planning aerial control learning robots autonomous robot path environments
1	12	391	3.1	control autonomous learning based robot planning vehicles multi systems autonomous vehicles
24	4	142	2.8	robot based control robots mobile quadruped gait design robot based algorithm
30	3	115	2.6	based networks trust system iot optimization systems vehicles service management
19	4	164	2.4	robot control based humanoid design research planning university waseda waseda university
21	2	154	1.3	control robot based multi robots tracking research underwater design vehicles
31	1	114	0.9	agent multi systems multi agent control agent systems time formation varying time varying
26	1	129	0.8	trust autonomous driving human control autonomous driving based systems automation teaming

The number of publications from the TAS subfields in which these communities appear can be found below:

Table 4.2: Subfields of gap communities

community	KL1	KL5	Law	Mental Health	Multi Agent System	Verification & Validation
0	4	94	4	1	2	1257
1	62	108	9	0	0	584
2	24	44	5	0	3	618
3	9	99	1	0	5	399
4	19	54	2	0	0	534
5	1	129	8	0	1	418
6	4	37	0	0	1	583
7	10	118	5	2	4	336
8	9	192	3	1	1	254
9	27	88	3	0	0	365
10	20	57	4	0	0	380
11	6	238	1	7	6	178
12	7	57	2	0	1	305
13	73	61	11	0	3	261
14	0	39	1	1	0	0
15	0	87	27	18	0	0
16	14	48	0	0	2	411
17	10	166	2	3	18	87
18	6	19	0	1	0	303
19	1	9	0	0	0	264
20	3	43	2	0	1	306
21	7	18	0	0	1	321
22	0	22	3	0	0	254
23	2	77	1	1	1	181
24	6	12	0	0	0	260
25	4	112	0	1	3	122
26	18	54	2	0	5	113
27	0	90	0	1	1	20
28	2	93	1	1	2	118
29	2	103	1	0	0	112
30	5	122	1	5	0	82
31	2	25	0	1	1	248

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Table 4.2 Continued: Subfields of gap communities

community	KL1	KL5	KL4	Mental Health	Multi Agent System	Verification & Validation
32	4	120	40	2	3	39

4.2 GAPS

We considered the gaps of UK researchers to be the 10 communities with the lowest percentage of UK researchers.

These 10 communities represented 3,309 publications. To understand better the make up of these communities, we identified for each community:

- Top 3 Fields of Research
- Top 10 most cited articles
- Top 10 most prolific authors

4.2.1 FIELDS OF RESEARCH

We only show values here for the top 3, so a lack of value does not translate into 0 publications in that Field of Research. 4 of the 10 communities (24, 26, 27, and 30) were atypical, as they included research in 3 least common FOR: 10 Technology, 11 Medical and Health Sciences, 17 Psychology and Cognitive Sciences. The three most common fields were: 01 Mathematical Sciences, 08 Information and Computing Sciences, and 09 Engineering.

Table 4.3: Top 3 Fields of Research of gap communities

community	01 Mathematical Sciences	08 Information and Computing Sciences	09 Engineering	10 Technology	11 Medical and Health Sciences	17 Psychology and Cognitive Sciences
1	73.0	621	99.0	-	-	-
2	32.0	555	155.0	-	-	-
18	13.0	278	60.0	-	-	-
19	8.0	211	70.0	-	-	-
21	15.0	275	82.0	-	-	-
24	-	212	70.0	12.0	-	-
26	-	118	24.0	-	-	28.0
27	-	29	25.0	-	65.0	-
30	-	187	-	20.0	-	19.0
31	34.0	197	80.0	-	-	-

4.2.2 MOST CITED ARTICLES

We extracted the list of the 10 most cited publications in each community. Dimensions id (an hyperlink) is the internal publication id used in Dimensions - the Dimensions page gives more information if necessary.

Table 4.4: Top 10 most cited publications in gap communities

community	Number of citations	Dimensions id	title
1	451	pub.1095085083	Target-Driven Visual Navigation in Indoor Scenes Using Deep Reinforcement Learning
1	288	pub.1090658578	Reluplex: An Efficient SMT Solver for Verifying Deep Neural Networks
1	174	pub.1107085821	SqueezeSeg: Convolutional Neural Nets with Recurrent CRF for Real-Time Road-Object Segmentation from 3D LiDAR Point Cloud

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Table 4.4 Continued: Top 10 most cited publications in gap communities

community	Number of citations	Dimensions id	title
1	161	pub.1010405068	Team IHMC's Lessons Learned from the DARPA Robotics Challenge Trials
1	147	pub.1123987622	SoPhie: An Attentive GAN for Predicting Paths Compliant to Social and Physical Constraints
1	139	pub.1091001969	WaterGAN: Unsupervised Generative Network to Enable Real-Time Color Correction of Monocular Underwater Images
1	117	pub.1084204657	Secure State Estimation for Cyber-Physical Systems Under Sensor Attacks: A Satisfiability Modulo Theory Approach
1	108	pub.1063007392	Design of a Momentum-Based Control Framework and Application to the Humanoid Robot Atlas
1	100	pub.1061515633	A Learning-Based Framework for Velocity Control in Autonomous Driving
1	98	pub.1029930910	Dynamics and trajectory optimization for a soft spatial fluidic elastomer manipulator
2	189	pub.1107081552	End-to-End Driving Via Conditional Imitation Learning
2	168	pub.1061785910	Sensor Planning for a Symbiotic UAV and UGV System for Precision Agriculture
2	152	pub.1111459811	Learning agile and dynamic motor skills for legged robots
2	112	pub.1061351657	Self-Organization as a Supporting Paradigm for Military UAV Relay Networks
2	100	pub.1085284781	Sampling-Based Path Planning for UAV Collision Avoidance
2	84	pub.1110721079	Gibson Env: Real-World Perception for Embodied Agents
2	83	pub.1005138360	Internet of Vehicles: From intelligent grid to autonomous cars and vehicular fogs
2	83	pub.1100885197	Gait and Trajectory Optimization for Legged Systems Through Phase-Based End-Effector Parameterization
2	77	pub.1028351444	Optimization of Wireless Sensor Network and UAV Data Acquisition
21	77	pub.1028351444	Optimization of Wireless Sensor Network and UAV Data Acquisition
2	74	pub.1094237467	On Estimation of Wind Velocity, Angle-of-Attack and Sideslip Angle of Small UAVs Using Standard Sensors
18	378	pub.1092499789	AirSim: High-Fidelity Visual and Physical Simulation for Autonomous Vehicles

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Table 4.4 Continued: Top 10 most cited publications in gap communities

community	Number of citations	Dimensions id	title
18	143	pub.1094402851	Receding Horizon "Next–Best–View" Planner for 3D Exploration
18	132	pub.1094502309	From Perception to Decision: A Data-Driven Approach to End-to-End Motion Planning for Autonomous Ground Robots
18	113	pub.1094916508	Structural Inspection Path Planning via Iterative Viewpoint Resampling with Application to Aerial Robotics
18	105	pub.1041428317	Robot navigation in dense human crowds: Statistical models and experimental studies of human–robot cooperation
18	102	pub.1111260931	Motion Planning Among Dynamic, Decision-Making Agents with Deep Reinforcement Learning
18	79	pub.1013771741	Three-dimensional coverage path planning via viewpoint resampling and tour optimization for aerial robots
18	66	pub.1017862688	Receding horizon path planning for 3D exploration and surface inspection
18	60	pub.1095527701	Navigation Planning for Legged Robots in Challenging Terrain
18	58	pub.1037800557	Distributed coverage control for concave areas by a heterogeneous Robot–Swarm with visibility sensing constraints
19	110	pub.1061530332	Shape Sensing Techniques for Continuum Robots in Minimally Invasive Surgery: A Survey
19	83	pub.1061568238	Model Predictive Flocking Control for Second-Order Multi-Agent Systems with Input Constraints
19	63	pub.1025475988	Gait adaptation to visual kinematic perturbations using a real-time closed-loop brain–computer interface to a virtual reality avatar
19	49	pub.1047672345	A Wheeled Wall-Climbing Robot with Bio-Inspired Spine Mechanisms
19	40	pub.1061693608	Fall Detection and Prevention Control Using Walking-Aid Cane Robot
19	34	pub.1052422500	Echo state network based predictive control with particle swarm optimization for pneumatic muscle actuator
19	34	pub.1061542178	Bio-Inspired Embedded Vision System for Autonomous Micro-Robots: The LGMD Case

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Table 4.4 Continued: Top 10 most cited publications in gap communities

community	Number of citations	Dimensions id	title
19	30	pub.1107391646	An Echo State Gaussian Process-Based Nonlinear Model Predictive Control for Pneumatic Muscle Actuators
19	28	pub.1041814617	Intersection of "Tokku" Special Zone, Robots, and the Law: A Case Study on Legal Impacts to Humanoid Robots
19	26	pub.1061794623	Chaos and Bifurcation Control of Torque-Stiffness-Controlled Dynamic Bipedal Walking
21	133	pub.1061574036	Integral Line-of-Sight Guidance and Control of Underactuated Marine Vehicles: Theory, Simulations, and Experiments
21	64	pub.1061580452	Extreme Kernel Sparse Learning for Tactile Object Recognition
21	59	pub.1085329011	Weakly Paired Multimodal Fusion for Object Recognition
21	51	pub.1061419804	Innovation in Underwater Robots: Biologically Inspired Swimming Snake Robots
21	51	pub.1083507586	Integral Line-of-Sight Guidance for Path Following Control of Underwater Snake Robots: Theory and Experiments
21	45	pub.1061614944	An Assistive Navigation Framework for the Visually Impaired
21	42	pub.1061627452	Singularity Analysis and Avoidance for Robot Manipulators With Nonspherical Wrists
21	40	pub.1086101528	Structured Output-Associated Dictionary Learning for Haptic Understanding
21	40	pub.1120279620	PointNetGPD: Detecting Grasp Configurations from Point Sets
24	73	pub.1112167813	Adaptive Fuzzy Backstepping Control for Stable Nonlinear Bilateral Teleoperation Manipulators With Enhanced Transparency Performance
24	68	pub.1118069499	Reliable Intelligent Path Following Control for a Robotic Airship Against Sensor Faults
24	53	pub.1090555002	Solution of an Economic Dispatch Problem Through Particle Swarm Optimization: A Detailed Survey - Part I
24	52	pub.1094314052	The Obstacle Detection and Obstacle Avoidance Algorithm Based on 2-D Lidar
24	46	pub.1101622480	Adaptive robust INS/UWB-integrated human tracking using UFIR filter bank

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Table 4.4 Continued: Top 10 most cited publications in gap communities

community	Number of citations	Dimensions id	title
24	35	pub.1061574018	Model-Free Unified Tracking and Regulation Visual Servoing of Wheeled Mobile Robots
24	35	pub.1004762652	A Learning-Based Fault Tolerant Tracking Control of an Unmanned Quadrotor Helicopter
24	34	pub.1123650534	RBF-Neural-Network-Based Adaptive Robust Control for Nonlinear Bilateral Teleoperation Manipulators With Uncertainty and Time Delay
24	34	pub.1101276501	Complete and Time-Optimal Path-Constrained Trajectory Planning With Torque and Velocity Constraints: Theory and Applications
24	32	pub.1002746216	Adaptive controller design for underwater snake robot with unmatched uncertainties
26	107	pub.1061659207	Lane Change and Merge Maneuvers for Connected and Automated Vehicles: A Survey
26	76	pub.1095635026	Prospect Theory for Enhanced Cyber-Physical Security of Drone Delivery Systems: A Network Interdiction Game
26	61	pub.1061539391	Design Automation of Cyber-Physical Systems: Challenges, Advances, and Opportunities
26	38	pub.1063942510	Engineering Trust in Complex Automated Systems
26	35	pub.1100200516	Distributed Conflict Resolution for Connected Autonomous Vehicles
26	34	pub.1094072377	Cyber-Physical Systems: A Security Perspective
26	31	pub.1091066316	Developing a Distributed Consensus-Based Cooperative Adaptive Cruise Control System for Heterogeneous Vehicles with Predecessor Following Topology
26	31	pub.1093215092	A non-conservatively defensive strategy for urban autonomous driving
26	28	pub.1094663946	Spatially-Partitioned Environmental Representation and Planning Architecture for On-Road Autonomous Driving
26	25	pub.1061358089	Testing Autonomous Vehicle Software in the Virtual Prototyping Environment
26	25	pub.1061358089	Testing Autonomous Vehicle Software in the Virtual Prototyping Environment

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Table 4.4 Continued: Top 10 most cited publications in gap communities

community	Number of citations	Dimensions id	title
27	167	pub.1035801075	2 month evening and night closed-loop glucose control in patients with type 1 diabetes under free-living conditions: a randomised crossover trial
27	167	pub.1092858682	Standardizing Clinically Meaningful Outcome Measures Beyond HbA1c for Type 1 Diabetes: A Consensus Report of the American Association of Clinical Endocrinologists, the American Association of Diabetes Educators, the American Diabetes Association, the Endocrine Society, JDRF International, The Leona M. and Harry B. Helmsley Charitable Trust, the Pediatric Endocrine Society, and the T1D Exchange
27	130	pub.1019721225	Day and night glycaemic control with a bionic pancreas versus conventional insulin pump therapy in preadolescent children with type 1 diabetes: a randomised crossover trial
27	93	pub.1052203965	Day and Night Closed-Loop Control Using the Integrated Medtronic Hybrid Closed-Loop System in Type 1 Diabetes at Diabetes Camp
27	91	pub.1070730155	Randomized Crossover Comparison of Personalized MPC and PID Control Algorithms for the Artificial Pancreas
27	78	pub.1070730191	Day-and-Night Closed-Loop Glucose Control in Patients With Type 1 Diabetes Under Free-Living Conditions: Results of a Single-Arm 1-Month Experience Compared With a Previously Reported Feasibility Study of Evening and Night at Home
27	69	pub.1045960365	Continuous Glucose Monitoring, Future Products, and Update on Worldwide Artificial Pancreas Projects
27	56	pub.1059250223	Glycemia, Treatment Satisfaction, Cognition, and Sleep Quality in Adults and Adolescents with Type 1 Diabetes When Using a Closed-Loop System Overnight Versus Sensor-Augmented Pump with Low-Glucose Suspend Function: A Randomized Crossover Study
27	55	pub.1090957690	Closed-Loop Control Without Meal Announcement in Type 1 Diabetes
27	54	pub.1059250020	Circadian Variability of Insulin Sensitivity: Physiological Input for In Silico Artificial Pancreas

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Table 4.4 Continued: Top 10 most cited publications in gap communities

community	Number of citations	Dimensions id	title
30	219	pub.1061786795	Trust Management for SOA-Based IoT and Its Application to Service Composition
30	181	pub.1061585521	Trust-Based Service Management for Social Internet of Things Systems
30	131	pub.1019960911	A survey of trust computation models for service management in internet of things systems
30	116	pub.1009119330	A Survey on Trust Modeling
30	97	pub.1107487537	Fair Resource Allocation in an Intrusion-Detection System for Edge Computing
30	87	pub.1095551285	On the Design of a Blockchain Platform for Clinical Trial and Precision Medicine
30	83	pub.1061663272	Deep Learning of Transferable Representation for Scalable Domain Adaptation
30	60	pub.1091091025	Trust-Based Decision Making for Health IoT Systems
30	56	pub.1112265351	HUOPM: High-Utility Occupancy Pattern Mining
30	55	pub.1113363062	Cooperative Heterogeneous Multi-Robot Systems: A Survey
31	327	pub.1061628218	Time-Varying Formation Tracking for Second-Order Multi-Agent Systems Subjected to Switching Topologies With Application to Quadrotor Formation Flying
31	238	pub.1006932452	Time-varying formation control for general linear multi-agent systems with switching directed topologies
31	169	pub.1104335965	Secure and Trustable Electronic Medical Records Sharing using Blockchain.
31	156	pub.1061785765	HumanRobot Interaction Control of Rehabilitation Robots With Series Elastic Actuators
31	107	pub.1018913667	Path following control for marine surface vessel with uncertainties and input saturation
31	105	pub.1061628339	Adaptive Backstepping Control of Spacecraft Rendezvous and Proximity Operations With Input Saturation and Full-State Constraint
31	98	pub.1052562881	Distributed consensus tracking for multi□agent systems under two types of attacks
31	93	pub.1061574109	Distributed Formation and Reconfiguration Control of VTOL UAVs

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Table 4.4 Continued: Top 10 most cited publications in gap communities

community	Number of citations	Dimensions id	title
31	76	pub.1004475247	Formation-containment control for high-order linear time-invariant multi-agent systems with time delays
31	71	pub.1104893603	A novel control scheme for quadrotor UAV based upon active disturbance rejection control

4.2.3 MOST PROLIFIC AUTHORS

We extracted the 10 most prolific authors in each of the gap communities. The table below indicates:

- Dimensions Researcher ID: Unique ID given by Dimensions - click on it to visit the Dimensions' profile.
- First and last name
- Current research organisation: based on their latest publication (they may have moved since and not published yet)
- Number of publication in the TAS corpus, 2015-19
- Total publication during their career
- Year of first publication

As expected, some communities have a strong presence of some universities / countries.

Table 4.5: Top 10 most prolific authors in gap communities

community	Dimensions Researcher ID	First name	Last name	Current research organisation	Number of TAS publications (2015-19)	Total publications	Year of first publication
1	ur.015464463443.24	Aaron D	Ames	California Institute of Technology, US	51	353	2004
1	ur.016352146334.19	Mykel John	Kochenderfer	Stanford University, US	47	334	2003
1	ur.01110032721.90	Claire Jennifer	Tomlin	University of California, Berkeley, US	44	547	1995
1	ur.01222505760.00	Sanjit A	Seshia	University of California, Berkeley, US	28	287	1999
1	ur.014217552372.11	Francesco	Borrelli	University of California, Berkeley, US	24	273	2000
1	ur.014545134173.44	Marco	Pavone	Stanford University, US	23	281	2006
1	ur.0125740622l5.75	George J	Pappas	University of Pennsylvania, US	20	621	1992
1	ur.013521135655.27	Anca Diana	Dragan	University of California, Berkeley, US	19	148	2009
1	ur.012601745633.86	Dorsa	Sadigh	Stanford University, US	18	115	2012
1	ur.0734347362.02	Silvio	Savarese	Stanford University, US	17	310	2001
2	ur.013064157174.12	Vijay R	Kumar	University of Pennsylvania, US	56	714	1988
2	ur.012510415254.00	Tor Arne	Johansen	Norwegian University of Science and Technology, Norway	54	668	1992
2	ur.010540121235.41	Magnus B	Egerstedt	Georgia Institute of Technology, US	34	506	1998
2	ur.011530600043.48	Pratap	Tokekar	University System of Maryland, US	31	113	2009
2	ur.015450754237.03	Marco	Hutter	ETH Zurich, Switzerland	25	184	2009
2	ur.013105762777.11	Robert	Fitch	University of Technology Sydney, Australia	23	108	2001
2	ur.073723411 3.43	Sivakumar R	Rathinam	Texas A&M University, US	21	250	1997
2	ur.07407700475.18	Martin	Saska	Czech Technical University in Prague, Czechia	21	123	2006
2	ur.0106006511 71.55	Rajnikant	Sharma	University of Cincinnati, US	20	74	2008
2	ur.015520141011.40	M Ani	Hsieh	University of Pennsylvania, US	19	111	2005
18	ur.012724070177.29	Roland Yves	Siegwart	ETH Zurich, Switzerland	56	845	1991
18	ur.014217202363.26	Jonathan P	How	Massachusetts Institute of Technology, US	26	585	1990
18	ur.01244441146.29	Erdal	Kayacan	Aarhus University, Denmark	23	163	2006
18	ur.014404445275.38	Sebastian Andreas	Scherer	Carnegie Mellon University, US	23	136	2006

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Table 4.5 Continued: Top 10 most prolific authors in gap communities

community	Dimensions Researcher ID	First name	Last name	Current research organisation	Number of TAS publications (2015-19)	Total publications	Year of first publication
18	ur.010733522703.19	Juan I	Nieto	ETH Zurich, Switzerland	22	231	2003
18	ur.015302621047.29	Holger	Voos	University of Luxembourg, Luxembourg	21	197	1999
18	ur.0663325775.20	Anthony P	Tzes	New York University Abu Dhabi, UAE	19	333	1987
18	ur.012011401146.46	Pascual	Campoy	Technical University of Madrid, Spain	17	153	1985
18	ur.011461246305.92	Rong	Xiong	Zhejiang University, China	16	176	2006
18	ur.015464217535.97	Angela P	Schoellig	University of Toronto, Canada	16	144	2011
19	ur.015177757701.87	Qiang	Huang	Beijing Institute of Technology, China	51	540	1998
19	ur.014402377301.00	Zhangguo	Yu	Beijing Institute of Technology, China	27	132	2007
19	ur.07647650055.11	Marco	Ceccarelli	University of Rome Tor Vergata, Italy	27	539	1992
19	ur.01063256350.86	Atsuo	Takanishi	Waseda University, Japan	26	754	1985
19	ur.010644723173.36	Xuechao	Chen	Beijing Institute of Technology, China	26	118	2008
19	ur.014752351213.47	Kenji	Hashimoto	Meiji University, Japan	22	201	2004
19	ur.015355324771.30	Min Zhou	Luo	Hohai University, China	22	112	2004
19	ur.010503463537.01	Weimin	Zhang	Beijing Institute of Technology, China	18	106	2003
19	ur.013702611452.06	Giuseppe	Carbone	University of Calabria, Italy	18	267	2001
19	ur.015050734771.74	Aiguo	Ming	University of Electro-Communications, Japan	17	282	1988
21	ur.012033404053.95	Kristin Ytterstad	Pettersen	Norwegian University of Science and Technology, Norway	40	299	1996
21	ur.014522503177.01	Bin	Liang	Tsinghua University, China	38	281	1997
21	ur.010235131107.68	Jan Tommy	Gravdahl	Norwegian University of Science and Technology, Norway	29	249	1994
21	ur.011475452101.18	Xueqian	Wang	Tsinghua University, China	29	128	2008
21	ur.0714033245.01	Lin-Cheng	Shen	National University of Defense Technology, China	29	194	2001
21	ur.012613212245.26	Fu-Chun	Sun	Tsinghua University, China	28	568	1996

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Table 4.5 Continued: Top 10 most prolific authors in gap communities

community	Dimensions Researcher ID	First name	Last name	Current research organisation	Number of TAS publications (2015-19)	Total publications	Year of first publication
21	ur.010261716423.12	Wen-Fu	Xu	Harbin Institute of Technology, China	27	193	2006
21	ur.011440411344.16	Xiangke	Wang	National University of Defense Technology, China	19	94	2008
21	ur.015725241143.08	Bing	Li	Harbin Institute of Technology, China	18	229	2005
21	ur.012403701571.29	Jianwei	Zhang	Universität Hamburg, Germany	17	500	1996
24	ur.015042462574.09	Shu-Gen	Ma	Ritsumeikan University, Japan	49	484	1988
24	ur.01025126741 1.90	Yi-Bin	Li	Shandong University, China	41	281	2004
24	ur.016266645643.91	Xue Wen	Rong	Shandong University, China	27	101	2010
24	ur.016325607353.91	Yong-Chun	Fang	Nankai University, China	24	270	2003
24	ur.011550677400.44	Jun	Luo	Shanghai University, China	21	1061	2000
24	ur.015771467163.55	Xue-Bo	Zhang	Nankai University, China	18	97	2008
24	ur.016301535632.81	Wu-Xi	Shi	Tianjin Polytechnic University, China	18	53	2010
24	ur.0701206733.38	Bin	Li	Changchun Institute of Optics, Fine Mechanics and Physics, China	18	356	1989
24	ur.074537070 11.45	Yong	Song	Shandong University, China	18	61	2010
24	ur.0664616375.53	Ning Xi	Xi	University of Hong Kong, China	15	843	1992
26	ur.01176602220.03	Masayoshi Tomizuka	Tomizuka	University of California, Berkeley, US	44	835	1970
26	ur.01324734101.94	Joseph B	Lyons	United States Air Force Research Laboratory, US	21	77	2005
26	ur.011453010033.68	Shin'Ichi	Shiraishi	Toyota (United States), US	15	51	2013
26	ur.011255066631.44	Matthew J	Barth	University of California, Riverside, US	13	231	1986
26	ur.014252760111.10	Chung-Wei	Lin	National Taiwan University, Taiwan	12	70	2006
26	ur.014265517203.65	Tamer	Başar	University of Illinois at Urbana Champaign, US	12	829	1981
26	ur.015250007575.56	Ching-Yao	Chan	University of California, Berkeley, US	11	99	1987

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Table 4.5 Continued: Top 10 most prolific authors in gap communities

community	Dimensions Researcher ID	First name	Last name	Current research organisation	Number of TAS publications (2015-19)	Total publications	Year of first publication
26	ur.015470161565.23	Changliu	Liu	University of California, Berkeley, US	11	20	2014
26	ur.011230016471.17	Gene M	Alarcon	United States Air Force Research Laboratory, US	9	48	2009
26	ur.016671422627.08	Guoyuan	Wu	University of California, Riverside, US	9	102	2006
27	ur.0757070670.80	Eyal	Dassau	Harvard University, US	21	221	2000
27	ur.0631170417.27	Bruce A	Buckingham	Stanford University, US	17	296	1971
27	ur.011526407377.26	Francis Joseph	Doyle	Harvard University, US	16	557	1989
27	ur.0740136462.78	Claudio	Cobelli	University of Padua, Italy	14	904	1972
27	ur.0742300401.14	Dirk	Abel	RWTH Aachen University, Germany	14	404	1987
27	ur.01217676525.55	Steffen Leonhardt	Leonhardt	RWTH Aachen University, Germany	13	588	1991
27	ur.01262610720.12	Gregory P	Forlenza	University of Colorado Anschutz Medical Campus, US	12	122	2010
27	ur.012457367 12.50	David Matthew	Maahs	Stanford University, US	9	398	2004
27	ur.015454112441.53	Berno Johannes Engelbert	Misgeld	RWTH Aachen University, Germany	9	105	2004
30	ur.010217600452.29	Vishal	Sharma	Soonchunhyang University, South Korea	18	100	2011
30	ur.016021614307.33	Ing-Ray	Chen	Virginia Tech, US	18	211	1990
30	ur.016654166657.27	Il-Sun	You	Soonchunhyang University, South Korea	17	334	2003
30	ur.01036623326.88	Jin-Hee	Cho	Virginia Tech, US	16	136	2005
30	ur.011235037605.92	Mo M	Jamshidi	The University of Texas at San Antonio, US	15	298	1982
30	ur.0110163561 15.95	Phillip S	Yu	University of Illinois at Chicago, US	14	1688	1981
30	ur.010354761605.12	Liang	Sun	New Mexico State University, US	13	44	2009
30	ur.010354410365.01	Kim-Kwang Raymond	Choo	The University of Texas at San Antonio, US	11	910	2004
30	ur.013556216353.12	Florin	Pop	Polytechnic University of Bucharest, Romania	11	291	2006

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Table 4.5 Continued: Top 10 most prolific authors in gap communities

community	Dimensions Researcher ID	First name	Last name	Current research organisation	Number of TAS publications (2015-19)	Total publica-tions	Year of first publica-tion
30	ur.01370554514 2.04	Philippe	Fournier-Viger	Harbin Institute of Technology, China	11	301	2005
31	ur.07506441337.23	Xi-Wang	Dong	Beihang University, China	63	210	2012
31	ur.015127505535.83	Zhang	Ren	Beihang University, China	59	288	2001
31	ur.012152654241.94	Qingdong	Li	Beihang University, China	54	218	2012
31	ur.07447517017.32	Zeng-Qiang	Chen	Nankai University, China	42	552	1994
31	ur.013372134321.11	Zhong-Xin	Liu	Nankai University, China	27	139	2006
31	ur.012143120067.39	Li-Hua	Xie	Nanyang Technological University, Singapore	25	924	1989
31	ur.011163136455.79	Guoqiang	Hu	Nanyang Technological University, Singapore	19	231	2004
31	ur.011263144457.70	Hong-Yong	Yang	Ludong University, China	19	100	2006
31	ur.014121146774.96	Ben-Mei	Chen	Chinese University of Hong Kong, China	15	420	1990
31	ur.010333720460.17	Jianglong	Yu	Beihang University, China	13	37	2016

The following table contains only UK researchers not working with the TAS Hub.

Table 4.6: Top 10 most prolific UK authors (not TAS researchers) in gap communities

community	Dimensions Researcher ID	First name	Last name	Current research organisation	Total publications	Year of first publication
1	ur.0155667557 45.17	Shiyan	Hu	University of Southampton, United Kingdom	148	2006
1	ur.0163625050 13.86	R B Ashith	Shyam	University of Surrey, United Kingdom	5	2016
1	ur.0157623311 33.05	Shahab	Kaynama	University of Manchester, United Kingdom	16	2009
1	ur.0152546160 41.48	Peter C	Young	Lancaster University, United Kingdom	203	1976
1	ur.0131126661 60.61	Amanda	Prorok	University of Cambridge, United Kingdom	45	2016
1	ur.0126324663 4.34	Fumiya	Iida	University of Cambridge, United Kingdom	198	1998
1	ur.0123553536 12.13	Mohammad Mahdi	Tajiki	Queen Mary University of London, United Kingdom	22	2014
1	ur.0124512557 23.00	Mohammad	Shojafar	University of Surrey, United Kingdom	132	2008
1	ur.0111232662 32.98	Perla	Maiolino	University of Oxford, United Kingdom	43	2011
1	ur.0101623277 15.92	Rayna	Dimitrova	University of Leicester, United Kingdom	59	2008
1	ur.0101054524 35.17	Marija	Popovic	Imperial College London, United Kingdom	38	2016
1	ur.0120311557 70.22	Luca	Scimeca	University of Cambridge, United Kingdom	14	2017
2	ur.0156205507 61.74	Prathyush Purushothama	Menon	University of Exeter, United Kingdom	119	2004
2	ur.0147276556 00.24	Amy	Widdicombe	University College London, United Kingdom	4	2018
2	ur.0143023006 65.71	Graham	White	IBM (United Kingdom), United Kingdom	7	2019
2	ur.0143001602 70.04	Shoaib	Ehsan	University of Essex, United Kingdom	109	2009
2	ur.0157716623 73.39	Qingbiao	Li	University of Cambridge, United Kingdom	10	2019
2	ur.0165564147 37.97	Klaus Dieter	Mcdonald-Maier	University of Essex, United Kingdom	257	2005
2	ur.0161145504 11.66	Simon	Pearson	University of Lincoln, United Kingdom	92	1981
2	ur.0142724656 74.66	Richard J	Tomsett	IBM (United Kingdom), United Kingdom	19	2014
2	ur.0742747633.25	Kristofer	Gryte	University of Oxford, United Kingdom	15	2007
2	ur.0765167307 5.47	Saad	Minhas	University of Essex, United Kingdom	2	2016

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Table 4.6 Continued: Top 10 most prolific UK authors (not TAS researchers) in gap communities

community	Dimensions Researcher ID	First name	Last name	Current research organisation	Total publications	Year of first publication
2	ur.016043033210.68	Leandro	Soriano Marcolino	Lancaster University, United Kingdom	5	2016
2	ur.013552043570.34	Michael	Bloesch	Imperial College London, United Kingdom	63	2012
2	ur.0615002723.39	Grzegorz	Cielniak	University of Lincoln, United Kingdom	66	2003
2	ur.014161003547.06	Russell	Buchanan	University of Oxford, United Kingdom	8	2019
2	ur.0125261517l7.64	Ales X C	Leonardis	University of Birmingham, United Kingdom	245	1989
2	ur.012310524575.38	Tom	Duckett	University of Lincoln, United Kingdom	130	1998
2	ur.011530074611.74	Fernando E B	Otero	University of Kent, United Kingdom	57	2003
2	ur.013266065477.66	Geeth Ranmal	De Mel	IBM (United Kingdom), United Kingdom	61	2008
2	ur.011064642327.36	Gavin	Pearson	Defence Science and Technology Laboratory, United Kingdom	27	2008
2	ur.012613656361.36	Keerthy	Kusumam	University of Nottingham, United Kingdom	7	2015
2	ur.013112666160.61	Amanda	Prorok	University of Cambridge, United Kingdom	45	2016
2	ur.013007422476.30	Simon Justin	Julier	University College London, United Kingdom	173	1995
18	ur.01257057527.63	Robert I Bob	John	University of Nottingham, United Kingdom	186	1997
18	ur.015607556552.22	Mario	Gianni	Plymouth University, United Kingdom	21	2012
18	ur.010737334025.61	Henrik	Hesse	University of Glasgow, United Kingdom	37	2009
18	ur.014654670565.92	Hani A	Hagras	University of Essex, United Kingdom	276	1999
18	ur.013226371675.72	Ioannis	Arvanitakis	Coventry University, United Kingdom	22	2010
18	ur.014275160435.24	Stefan	Leutenegger	Imperial College London, United Kingdom	84	2008
18	ur.015503517377.17	Peer-Olaf	Siebers	University of Nottingham, United Kingdom	128	2004
18	ur.014005165563.94	Utkarsh	Agrawal	University of St Andrews, United Kingdom	35	2014
18	ur.01106765460.84	Jonathan Mark	Garibaldi	University of Nottingham, United Kingdom	313	1994
18	ur.011642070315.56	Zisos	Mitros	King's College London, United Kingdom	8	2016
18	ur.014372442272.17	Sotiris	Papatheodorou	Imperial College London, United Kingdom	23	2016

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Table 4.6 Continued: Top 10 most prolific UK authors (not TAS researchers) in gap communities

community	Dimensions Researcher ID	First name	Last name	Current research organisation	Total publications	Year of first publication
18	ur.010105452435.17	Marija	Popovic	Imperial College London, United Kingdom	38	2016
18	ur.013552043570.34	Michael	Bloesch	Imperial College London, United Kingdom	63	2012
18	ur.010017423355.04	Mojtaba Ahmadieh	Khanesar	University of Nottingham, United Kingdom	92	2007
19	ur.07351235644.61	Martim	Brando	University of Oxford, United Kingdom	2	2016
19	ur.016021616543.10	Shi-Gang	Yue	University of Lincoln, United Kingdom	173	2001
19	ur.0154036266l7.01	Mingfeng	Wang	University of Nottingham, United Kingdom	21	2009
19	ur.014664645547.31	Maurice F	Fallon	University of Oxford, United Kingdom	76	2007
19	ur.014545637317.55	Ioannis	Havoutis	University of Oxford, United Kingdom	61	2008
19	ur.014051472541.88	Farshad	Arvin	University of Manchester, United Kingdom	77	2009
19	ur.01175430571.30	Dario	Farina	Imperial College London, United Kingdom	778	1999
19	ur.012752265643.22	Chenguang	Yang	University of the West of England, United Kingdom	404	2007
19	ur.014726760421.17	Matteo	Russo	University of Nottingham, United Kingdom	48	2016
19	ur.012160140766.39	Martim	Brandão	King's College London, United Kingdom	30	2012
19	ur.010534545456.38	Alessandro G	Di Nuovo	Sheffield Hallam University, United Kingdom	95	2005
21	ur.01126037624.57	Sethu	Vijayakumar	University of Edinburgh, United Kingdom	188	1995
21	ur.012307306333.27	Yiming	Yang	University of Edinburgh, United Kingdom	10	2015
21	ur.013160373267.28	Francesco	Nori	DeepMind (United Kingdom), United Kingdom	175	2003
21	ur.016267477775.23	Zhe	Liu	University of Cambridge, United Kingdom	60	2012
24	ur.01340113120.40	Hong-Bin	Liu	King's College London, United Kingdom	129	2007
24	ur.0615420070.03	Shuai	Li	Swansea University, United Kingdom	280	2007
26	ur.015566755745.17	Shiyan	Hu	University of Southampton, United Kingdom	148	2006
27	ur.01252246053.41	Oscar E	Della Pasqua	University College London, United Kingdom	148	2001
27	ur.0666032124.11	Katharine D	Barnard	Bournemouth University, United Kingdom	97	2006

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Table 4.6 Continued: Top 10 most prolific UK authors (not TAS researchers) in gap communities

community	Dimensions Researcher ID	First name	Last name	Current research organisation	Total publications	Year of first publication
27	ur.0642236621.93	Sean P	Oosterholt	University College London, United Kingdom	10	2015
30	ur.014025726525.54	Yulei	Wu	University of Exeter, United Kingdom	147	2007
30	ur.010424471355.22	Rajiv	Ranjan	Newcastle University, United Kingdom	338	2004
30	ur.012576370165.48	Djamel	Djenouri	University of the West of England, United Kingdom	119	2003
30	ur.013266065477.66	Geeth Ranmal	De Mel	IBM (United Kingdom), United Kingdom	61	2008
30	ur.013007422476.30	Simon Justin	Julier	University College London, United Kingdom	173	1995
30	ur.014302300665.71	Graham	White	IBM (United Kingdom), United Kingdom	7	2019
30	ur.011064642327.36	Gavin	Pearson	Defence Science and Technology Laboratory, United Kingdom	27	2008
30	ur.01502602721 7.37	Newton	Howard	University of Oxford, United Kingdom	91	2009
30	ur.016713614564.34	Shushma D	Patel	London South Bank University, United Kingdom	59	1987

5 Appendix

5.1 LIST OF TAS HUB RESEARCHERS

5.1.1 TAS HUB CO-INVESTIGATORS

- Professor Sarvapali (Gopal) Ramchurn University of Southampton
- Professor Wendy Adams University of Southampton
- Professor Tanya Aplin King's College London
- Professor Steve Benford University of Nottingham
- Dr Rita Borgo King's College London
- Professor Gary Burnett University of Nottingham
- Professor Michael Butler University of Southampton
- Dr Adriane (Age) Chapman University of Southampton
- Dr Hana Chockler King's College London
- Professor Prokar Dasgupta King's College London
- Dr Kate Devlin King's College London
- Professor Diana Eccles University of Southampton
- Dr Christian Enemark University of Southampton
- Dr Christine Evers University of Southampton
- Dr Joel Fischer Research Director
- Dr Murray Goulden University of Nottingham
- Professor Susan Gourvenec University of Southampton

- Professor Dame Wendy Hall University of Southampton
- Dr Ann-Marie Hughes University of Southampton
- Professor Richard Hyde University of Nottingham
- Professor Mark Kleinman King's College London
- Dr Boriana Koleva University of Nottingham
- Professor Paul Luff King's College London
- Professor Derek (Mac) McAuley University of Nottingham
- Professor Luc Moreau King's College London
- Dr Elvira Perez University of Nottingham
- Dr Katie Plant University of Southampton
- Dr Rita Samiolo King's College London
- Professor James Scanlan University of Southampton
- Professor Sarah Sharples University of Nottingham
- Professor Paurav Shukla University of Southampton
- Dr Alexa Spence University of Nottingham
- Professor Crawford Spence King's College London
- Dr Mercedes Torres Torres University of Nottingham
- Professor Carmine Ventre King's College London
- Professor Luca Vigano King's College London
- Dr Christian Wagner University of Nottingham

5.1.2 NODE PIS & CO-IS

- Dr S Windsor (PI) University of Bristol
- Dr J J J Downer University of Bristol
- Professor K Eder University of Bristol
- Dr JCS Ives University of Bristol
- Professor JM Rossiter University of Bristol
- Dr S Hauert University of Bristol
- Professor S Ramamoorthy (PI) University of Edinburgh

5. APPENDIX

- Professor S Vallor University of Edinburgh
- Dr A Rajan University of Edinburgh
- Professor A Lascarides University of Edinburgh
- Professor AA Miller University of Glasgow
- Professor A Crabtree University of Nottingham
- Professor B Schafer University of Edinburgh
- Professor RA Williams University of Edinburgh
- Professor C Marsden University of Sussex
- Professor A Bundy University of Edinburgh
- Dr V Belle University of Edinburgh
- Professor A Ireland Heriot-Watt University
- Dr H Chockler Kings College London
- Dr LD Urquhart University of Edinburgh
- Dr PB Jackson University of Edinburgh
- Dr P Li University of Sussex
- Dr R Calinescu (PI) University of York
- Professor M Levine Lancaster University
- Professor S Dogramadzi University of Sheffield
- Professor B Nuseibeh Open University
- Professor LS Mihaylova University of Sheffield
- Dr Katie Plant University of Southampton
- Dr J A Law University of Sheffield
- Professor J Wilson University of York
- Dr A Bennaceur Open University
- Professor A Thiruvallore Thattai University of York
- Professor A Thomas University of York
- Dr I Habli University of York
- Professor ALC Cavalcanti University of York
- Professor N Suri (PI) Lancaster University
- Professor G Inalhan Cranfield University
- Professor CA May-Chahal Lancaster University

- Professor PP Angelov Lancaster University
- Professor A Tsourdos Cranfield University
- Professor W Guo Cranfield University
- Dr L Dorn Cranfield University
- Dr C Easton Lancaster University
- Dr V Giotsas Lancaster University
- Professor D Hutchison Lancaster University
- Dr JE Deville Lancaster University
- Professor HF Hastie (PI) Heriot-Watt University
- Professor A Cangelosi University of Manchester
- Professor G Rajendran Heriot-Watt University
- Professor Y Demiris Imperial College London
- Professor M Mousavi (PI) University of Leicester
- Dr U C Turker University of Leicester
- Professor M Fisher University of Manchester
- Dr J Rojas Siles University of Leicester
- Professor JCP Woodcock University of York
- Dr G Kefalidou University of Leicester
- Professor R Hierons University of Sheffield
- Dr L Dennis University of Manchester
- Professor R Richardson University of Leeds
- Professor IY Tyukin University of Leicester
- Professor LE Law University of Leicester
- Professor G Brown University of Manchester
- Dr B Kaddouh University of Leeds
- Dr J O Ringert University of Leicester
- Dr C Zhou University of Leeds
- Professor ALC Cavalcanti University of York