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I. Mavromatis Scholar
Greek, Born on February 14, 1989

# Dr Ioannis MAVROMATIS

*Research & Development Engineer*

## In a Nutshell

Ambitious Research & Development Engineer, currently working for Toshiba's Bristol Research & Innovation Laboratory (BRIL). As my key responsibility, I am leading the development of a Cloud-native backend/edge platform for the UMBRELLA IoT ecosystem. Concurrently, I am actively involved in various Cybersecurity-related research activities (CAVShield, CYTHEMIS projects), and in bid writing (CAVShield, SYNERGIA). In the past, I developed an open-source AI-assisted 5G simulation framework (DRIVE framework) and I co-led the design and deployment of a large-scale, open-source, low-latency platform for vehicular communications, aided by Mobile Edge Computing capabilities. Finally, I was actively involved in several extensive city-wide experimental campaigns for connected vehicles and proposed state-of-the-art algorithms for improving the robustness and availability of heterogeneous vehicular communications.

## Core Skills

- 5G Systems and V2X Communications
- Design/deployment of Real-world Testbeds
- Cloud-Native Systems and Architectures
- Link/system-level Network Simulation Frameworks
- Experience in Large-scale Real-world Field Trials
- Wireless Standards and Network Stack
- Software Engineering and Development
- Bid Writing
- Analytical thinking and logical problem fragmentation
- Scientific problem solving
- Teamwork/Team management
- Taking global approaches on problems

## Professional Experience

### Research & Industrial Positions

08/2019 - **Research & Development Engineer**, *Bristol Research & Innovation Laboratory, Toshiba Europe Ltd.*, Bristol, UK.

- **UMBRELLA** - Development and deployment of a real-world Cloud-Native Backend IoT Platform.
  - Involvement in large-scale wireless experimental campaign - preparation and data analysis.
- **CAVShield** - Leading/contributing on WP2: Cybersecurity on Cooperative Intelligent Transportation Systems.
- **CYTHEMIS** - Improvement/demonstration of an end-to-end Intrusion Prevention System.
- **Other** - Development of an open-source AI-assisted 5G simulation framework for C-ITSs (DRIVE framework).
  - Research activities and patent writing in various areas (Cybersecurity, Intelligent Transport Systems, Introduction Detection and Prevention solutions for IIoT).
  - Bid writing (CAVShield and SYNERGIA projects).

08/2019 - **Honorary Research Associate**, *University of Bristol*, Bristol, UK.

- Migration of AI-assisted Intelligent Transportation Solutions with Cloud-native and Mobile Edge Infrastructures.
- Development of a Cloud-Native platform for Reinforcement Learning agents.
- Supervision of students.

10/2018 - 08/2019 **Research Associate**, *University of Bristol*, Bristol, UK.

- **NG-CDI** - Development of an open-source AI-assisted 5G simulation framework for C-ITSs (DRIVE framework).
- **FLOURISH** - Development of a Fog Computing platform for large-scale connected vehicles experimentation.
  - Development and deployment of a prototyped ITS-G5 testbed.
  - Involvement in large-scale city-wide trials for connected vehicles - preparation and data analysis.
  - Design of an active jammer to test the performance of the prototyped ITS-G5 testbed.

02/2016 - 09/2018 **Research Assistant**, *University of Bristol*, Bristol, UK.

- **FLOURISH** - Deployment of a large-scale ITS-G5 vehicular communications platform.
  - Demonstration of city-wide connected vehicle trials and data analysis.
  - Development of a parallelised version of the OMNeT++ INET framework.
- **VENTURER** - Design of a Fog Computing framework for C-ITSs.
  - "Virtual Driving Testbed" Development (in-lab experimentation on vehicular communications).

04-09/2012 **Network Research Assistant (intern)**, *University Carlos III of Madrid (UC3M)*, Madrid, Spain.
- **FLAVIA** - Improvements on Energy Efficiency for WLAN networks, focusing on the IEEE 802.11b/g/n/u.
  - Modifications on the driver and firmware (OpenWRT), to accommodate the algorithms designed.
  - Prototype a testbed to evaluate the performance of the system.

### Networking and IT Positions

05-08/2013 **IT and Network Support and Consultant**, *"Unifast" Kiriakoulis Georgios*, Thessaloniki, Greece.
07-10/2008
- Planning and deploying IT and networking (wired/wireless) solutions for local businesses.
- Consulting on Enterprise Resource Planning (ERP) systems.
- IT support on Windows and Linux OSs.
- Installation of satellite systems.

07-08/2007 **IT and Network Support and Consultant**, *TITAN Cement*, Thessaloniki, Greece.
- Planning and deploying IT and industrial wired networking solutions.
- Programming/Testing PLC and SCADA automation systems.
- IT support on Windows and Linux OSs.

### Teaching Assistant / Lab Demonstrator

2017/2018 **"Mathematical Methods for Computer Scientists"** , University of Bristol, *BSc 1st year (80h)*.
**"Networking Protocol Principles"** , University of Bristol, *BSc 3rd year / MSc (20h)*.
**"Programming in C"**, University of Bristol, *MSc (70h)*.
**"Object Oriented Programming"** , University of Bristol, *BSc 2nd year (45h)*.
2016/2017 **"Mathematical Methods for Computer Scientists"**, University of Bristol, *BSc 1st year (80h)*.
**"Programming and Algorithms 2"**, University of Bristol, *BSc 1st year (45h)*.
2015/2016 **"Digital Signal Processing Systems"**, University of Bristol, *MSc (21h)*.
2014/2015 **"Digital Signal Processing Systems"**, University of Bristol, *MSc (21h)*.

### Other

1/2009 - 04/2012 **Illustrator and Graphics Designer (Images, Videos, Animations)**, *Freelancer*, Thessaloniki, Greece.
- Designing marketing material for small local companies.

6/2010 - 04/2011 **Public Relationship (PR) Specialist**, Thessaloniki, Greece.
- Promotion services on targeted audience for local pubs and bars.

## Education

10/2015 - 10/2018 **PhD in Communications (Research Phase)**, *Dept. of Electr. & Electron. Engineering, University of Bristol*, Bristol, UK.
- **PhD Title:** "5G Communication Framework for Smarter Autonomous Vehicles".

*Supervisors:* Prof Robert Piechocki, Prof Andrew Nix.
**Key achievements** - Developed a discrete-time system-level simulation framework for C-ITS research.
- Deployed a real-world ITS-G5 testbed - large-scale car trials were conducted later.
- Developed various novel solutions for the integration of MmWaves in the future C-ITSs.

10/2014 - 9/2015 **PhD in Communications (Taught Phase)**, *Dept. of Electr. & Electron. Engineering,* University of Bristol, Bristol, UK.
*One-year taught element (10 taught modules and a research group project).*
- **1st Year's Research Group Project:** "Localisation Of Strayed Targets (LOST)" (taught phase).

*Supervisor:* Prof Kevin Morris.
Design and development of a localisation system, over the White Space frequency band (implemented in LabView).

09/2013 - 09/2014 **MSc in "Wireless Communications and Signal Processing"**, *Dept. of Electr. & Electron. Engineering, University of Bristol*, Bristol, UK, *Grade: 68% - Pass with Merit*.
*Advanced topics on wireless communications and communications-related signal processing.*
- **MSc Thesis:** "Propagation Modelling using Iterative Physical Optics".

*Supervisor:* Prof Christopher Railton.
Design and development of a simulation framework, able to predict the performance of indoor communication links using Iterative Physical Optics (IPO) algorithms.

05/2007 - 11/2012 **BSc in "Information Technology Engineering"**, *Dept. of Information Technology, ATEI of Thessaloniki*, Thessaloniki, Greece, *Grade: 7.22/10*.

*Scientific and technological knowledge in "Computer Science and Engineering" and "Information and Communication Systems".*

- **BSc Thesis:** "Studying Quality of Experience (QoE) over Wireless Networks".

*Supervisor:* Prof Periklis Chatzimisios.

Investigate the impact of different wireless technologies (IEEE 802.11, IEEE 802.16, 3GPP LTE) on various data streams, using QoE metrics.

## Patents

03/2020 **U.S. Patent**, *US449398*, System and Method for Detecting and Rectifying Concept Drift in Federated Learning *(filed)*.

## Grants

### Ongoing Research

07/2020 **SYNERGIA Project**, ***Amount Awarded: £2,177,375***, Innovate UK, Project no. 133898, Period: 01/10/2020 - 30/09/2022.

- **Principal Backend Architect - Core bid writer.**

SYNERGIA will devise, develop and demonstrate a novel secure-by-design, endpoint-to-core IoT platform for large-scale networks of low-power resource-constrained devices. *Project to be led by BRIL - Toshiba Europe Ltd.*

### Completed Research

12/2019 **CAVShield Project**, ***Amount Awarded: £427,480***, Innovate UK, Project no. 133898, Period: 02/01/2020 - 31/03/2020.

- **Technical Work Package Lead. Lead Role within Toshiba's BRIL.**

The CAVShield project addressed the urgent global need for robust methods and techniques to identify and measure cyber-vulnerabilities in fleets of connected vehicles. *Project led by Honda R&D Europe (U.K.) Ltd.*

## Awards & Scholarships

05/2019 **IEEE Best Paper Award**, *IEEE Vehicular Technology Conference (IEEE VTC-Spring)*, Kuala Lumpur, Malaysia, 2019.

Best Paper award for my work "Agile Data Offloading over Novel Fog Computing Infrastructure for CAVs".

12/2018 **IEEE Popularity Award**, *IEEE Vehicular Networking Conference (VNC)*, Taipei, Taiwan, 2018.

Popularity award for my work "Parallel Implementation of the OMNeT++ INET Framework for V2X Communications".

9/2014 **Full EPSRC Studentship Funding**.

Studentship to support my PhD research for a 4-year term.

4/2012 **Erasmus Mundus Scholarship**.

Scholarship for my internship in UC3M for a 6-month period.

## Personal Development

### Training and Certifications

08/2020 **"Kubernetes MasterClass : Kubernetes & Docker Swarm for DevOps"**, Udemy, (Expected).

Course on Kubernetes, Docker, and Docker Swarm for DevOps, Image Creation & Deployment on Kubernetes, Docker Compose, HELM & HELM Charts.

08/2020 **"Machine Learning"**, Coursera, organised by Stanford University, (Expected).

Course providing a broad introduction to machine learning, data mining, and statistical pattern recognition. Topics: i) Supervised Learning, ii) Unsupervised Learning, iii) Best practices in machine learning, etc.

02/2011 **Cisco Certified Network Association (CCNA)**, *Dept. of Information Technology,* ATEI of Thessaloniki, Thessaloniki, Greece.

Advanced Network Knowledge (Installation, configuration, operation and troubleshooting of medium-size routed and switched networks).

08/2008 **Network Administration Professional Certificate**, *Vellum Global Educational Services,* University of Cambridge, Thessaloniki, Greece.

Basic Network Administration Knowledge (Routing Protocols, TCP/IP, Network Architectures, etc.).

### Summer Schools

06/2018 **"5G V2X Communications Summer School"**, Organised by: King's College London, London, UK..
Topics on 5G Vehicle-to-Everything (V2X) communications, as pertained to connected and autonomous driving.

07/2016 **"Car as a Service - creating tomorrow's smart mobility service platform"**, Organised by: BMW, EURECOM, and Technische Universität München, Tegernsee, Germany..
Topics on autonomous vehicles and next-generation vehicular applications.

## Publications

### Journals & Magazines

[J2] A. Tassi, **I. Mavromatis**, and R. J. Piechocki, "A Dataset of Full-Stack ITS-G5 DSRC Communications over Licensed and Unlicensed Bands Using a Large-Scale Urban Testbed", Elsevier Data-in-Brief Journal.

[J1] **I. Mavromatis**, A. Tassi, G. Rigazzi, R. J. Piechocki, and A. Nix, "Multi-Radio 5G Architecture for Connected and Autonomous Vehicles: Application and Design Insights", EAI Industrial Networks and Intelligent Systems. **(Invited Paper)**

### Conferences & Workshops

[C13] **I. Mavromatis**, R. J. Piechocki, M. Sooriyabandara, and Arjun Parekh "DRIVE: A Digital Network Oracle for Cooperative Intelligent Transportation Systems", in IEEE ISCC 2020, Rennes, France, July 2020.

[C12] **I. Mavromatis**, A. Tassi, R. J. Piechocki, and M. Sooriyabandara "On Urban Traffic Flow Benefits of Connected and Automated Vehicles", in IEEE VTC-Spring 2020, Antwerp, Belgium, May 2020.

[C11] X. Wang, **I. Mavromatis**, A. Tassi, R. Santos-Rodriguez, and R. J. Piechocki, "Location Anomalies Detection for Connected and Autonomous Vehicles", in IEEE CAVS 2019, Honolulu, Hawaii, September 2019.

[C10] **I. Mavromatis**, A. Tassi, and R. J. Piechocki, "Operating ITS-G5 DSRC over Unlicensed Bands: A City-Scale Performance Evaluation", in IEEE PIMRC 2019, Istanbul, Turkey, September 2019.

[C9] **I. Mavromatis**, A. Tassi, R. J. Piechocki, and A. Nix, "Efficient Millimeter-Wave Infrastructure Placement for City-Scale ITS", in IEEE VTC-Spring 2019, Kuala Lumpur, Malaysia, May 2019.

[C8] A. Tassi, **I. Mavromatis**, R. J. Piechocki, A. Nix, C. Compton, T. Poole, and W. Schuster, "Agile Data Offloading over Novel Fog Computing Infrastructure for CAVs", in IEEE VTC-Spring 2019, Kuala Lumpur, Malaysia, May 2019. **(IEEE Best Paper Award)**

[C7] A. Tassi, **I. Mavromatis**, R. J. Piechocki, and A. Nix, "Secure Data Offloading Strategy for Connected and Autonomous Vehicles", in IEEE VTC-Spring 2019, Kuala Lumpur, Malaysia, May 2019.

[C6] **I. Mavromatis**, A. Tassi, R. J. Piechocki, and A. Nix, "Parallel Implementation of the OMNeT++ INET Framework for V2X Communications", in IEEE VNC 2018, Taipei, Taiwan, December 2018. **(IEEE Popularity Award)**

[C5] **I. Mavromatis**, A. Tassi, R. J. Piechocki, and A. Nix, "A City-Scale ITS-G5 Network for Next-Generation Intelligent Transportation Systems: Design Insights and Challenges", in Ad-Hoc Now 2018.

[C4] **I. Mavromatis**, A. Tassi, R. J. Piechocki, and A. Nix, "Efficient V2V Communication Scheme for 5G MmWave Hyper-Connected CAVs", in IEEE ICC 2018 Workshop - 5G and Cooperative Autonomous Driving, Kansas, USA, May 2018.

[C3] **I. Mavromatis**, A. Tassi, R. J. Piechocki, and A. Nix, "Agile Calibration Process of Full-Stack Simulation Frameworks for V2X Communications", in IEEE VNC 2017, Torino, IT, November 2017.

[C2] **I. Mavromatis**, A. Tassi, R. J. Piechocki, and A. Nix, "MmWave System for Future ITS: A MAC-layer Approach for V2X Beam Steering", in IEEE VTC 2017-Fall, Toronto, CA, September 2017.

[C1] **I. Mavromatis**, A. Tassi, R. J. Piechocki, and A. Nix, "Beam Alignment for Millimetre Wave Links with Motion Prediction of Autonomous Vehicles", in IET Colloquium on Antennas, Propagation and RF Technology for Transport and Autonomous Platforms, Birmingham, UK, February 2017. **(Invited Paper)**

### Posters

[P1] **I. Mavromatis**, A. Tassi, R. J. Piechocki, and A. Nix, "Smart Communication Plane for Self-Driving Vehicles", BMW Summer School: Car as a Service, July 2016.

### Book Chapters

[B1] **I. Mavromatis**, and P. Chatzimisios, "Studying Quality of Experience (QoE) over Wireless Networks", Encyclopaedia of Information Science and Technology, 3rd Edition, IGI Global, August 2014.

### Working / Under submission

[W1] **I. Mavromatis**, T. Spyridopoulos, P. Carnelli, A. Khan, "Securing the Cooperative Intelligent Transportation Systems of the Future", to be submitted to IEEE Transaction on Vehicular Technology.

## Technical Skills

**Orchestration:** Kubernetes (both native and lightweight implementations), Docker, Docker Compose.
**Automation:** Vagrant, Ansible, Jenkins.
**Monitoring:** Grafana, Prometheus.
**Programming:** C, C++, MATLAB, Bash Scripting, GoLang, Java, Python, HTML, CSS, Javascript, PHP.
**Databases:** MySQL, PostgreSQL, InfluxDB, IBM DB2.
**Networking:** Wireshark/Tcpdump, Iperf3, OpenVPN, DHCP, DNS, FTP, LDAP, Nmap.
**Productivity:** Git, Jira, Trello.
**SDRs:** National Instrument's LabVIEW, GNU Radio.
**Simulators:** OMNeT++ (including Veins), SUMO, NS-2, NS-3, OPNET.
**OSs:** Linux-based Distributions (including kernel and driver programming), OS X, MS Windows.
**Doc. Editors:** LaTex, MS Office.
**Video/Image:** Adobe software suite (After Effects, Photoshop and Premiere), GIMP, OmniGraffle.

## Scientific Activities - Involvement

### TPC Member

2021 IEEE ICC
2020 IEEE PIMRC, IEEE ISCC, IEEE VTC-Spring, IARIA VEHICULAR, Ad-Hoc Now
2019 IEEE VTC-Spring, Ad-Hoc Now, IEEE PIMRC, IEEE VNC
2018 IEEE VTC-Fall, Ad-Hoc Now
2017 IEEE VTC-Fall
2016 IEEE VTC-Fall

### External Reviewer – Journals

2020 IEEE Transactions on Vehicular Technology (2), IEEE Wireless Communications Magazine (1), IEEE Journal On Selected Areas in Communications (JSAC) (1), MDPI Applied Sciences (1), MDPI Sensors (2), Elsevier Data In Brief (1), Elsevier Computer Communications (1), Springer Wireless Networks (1)
2019 IEEE Communications Magazine (1), Springer Wireless Networks (1), Elsevier Data In Brief (1), MDPI Energies (2), MDPI Electronics (1)
2018 Springer Wireless Networks (1), Hindawi Journal of Advanced Transportation (1), Elsevier Ad-Hoc Networks (1)

### External Reviewer – Conferences

2020 IEEE ISCC 2020 (7), IEEE PIMRC (2), IEEE VTC-Spring (2), Ad-Hoc Now (2), IARIA VEHICULAR 2020 (1)
2019 IEEE PIMRC (4), IEEE VTC-Spring (3), IEEE VNC (3), Ad-Hoc Now (3)
2018 IEEE VTC-Fall (2), Ad-Hoc Now (3)
2017 IEEE VTC-Fall (3)
2016 IEEE VTC-Fall (1)

## Students/Interns Advised

2020 (3 Months) **Jonathan Hebditch**, *Research Intern*, , Toshiba Europe Ltd.
- **Subject:** "Privacy and anonymity of an Industrial IoT platform: A VPN approach."

2020 (6 Months) **Jianwen Zhu**, *Industrial MSc Project*, MSc in Wireless Communications, Toshiba Europe Ltd.
- **Subject:** "A Low Latency MEC Solution for 5G Network Slicing."

*Co-Advisors:* Dr Jaya Thota, Mr Ben Holden.

2020 (6 Months) **Sanyam Vays**, *Industrial BSc Project*, BSc in Computer Engineering, Toshiba Europe Ltd.
- **Subject:** "AI-Based Intrusion Detection System for Industrial IoT."

*Co-Advisors:* Dr Theo Spyridopoulos, Dr Aftab Khan, Dr Pietro Carnelli.

2020 (6 Months) **Philip Masters**, *Industrial BSc Project*, BSc in Computer Engineering, Toshiba Europe Ltd.
- **Subject:** "Wireless Coordination of F1/10 Autonomous Vehicles."

*Co-Advisors:* Dr Anthony Portelli, Dr Michael Baddeley.

2020 (6 Months) **Iosif Koen**, *Erasmus+ Research Intern*, Department of Information Technology, International Hellenic University.
- **Subject:** "Enabling a Smart Edge Computing Plane for CAVs with Kubernetes."

*Co-Advisors:* Prof Robert Piechocki, Prof Periklis Chatzimisios.

2019 (5 Months) **Marie Aylward**, *BSc Project*, BSc in Electr. & Electron. Engineering, University of Bristol.
- **Subject:** "Benefits of Connected and Automated Vehicles on Large-Scale Urban Traffic Flow Use-cases."

*Co-Advisor:* Prof Robert Piechocki.

2019 (5 Months) **Maria Fernanda Espino Gonzalez**, *MSc Project*, MSc in Communication Networks, University of Bristol.
- **Subject:** "Spectrum Sharing Strategies for WiFi and Intelligent Transport Systems (ITS)."

*Co-Advisor:* Prof Robert Piechocki.

2019 (6 Months) **Samual Taylor**, Undergraduate Research Intern, University of Bristol.
- **Subject:** "A PiCar-based collision avoidance scenario: Design Insights and Experimental Testbed."

*Co-Advisors:* Prof Robert Piechocki, Dr Andrea Tassi.

2019 (5 Months) **Xinluan Bai**, *MSc Project*, MSc in Wireless Communication, University of Bristol.
- **Subject:** "Semi-persistent Scheduling for C-V2X Vehicle-to-Vehicle communication."

*Co-Advisor:* Prof Robert Piechocki

2019 (5 Months) **Yuanri (Blues) Xing**, *MSc Project*, MSc in Wireless Communication, University of Bristol.
- **Subject:** "Design Practices on an Agile Communication Infrastructure for Autonomous PiCars."

*Co-Advisor:* Prof Robert Piechocki

2019 (5 Months) **Yudi Fan**, *MSc Project*, MSc in Wireless Communication, University of Bristol.
- **Subject:** "A PiCar-based Collision Avoidance Scenario: Sensor Data Acquisition and a Simulated Approach."

*Co-Advisors:* Prof Robert Piechocki, Dr Andrea Tassi.

2019 (5 Months) **Zhe (Anton) Zhao**, *MSc Project*, MSc in Communication Networks, University of Bristol.
- **Subject:** "On the Enhancement of Traffic Flows Sharing CAVs Trajectory Intention."

*Co-Advisors:* Prof Robert Piechocki, Dr Andrea Tassi.

2018-2019 (11 Months) **Jonathan Thomas**, *PhD Research Project*, PhD in Communications, University of Bristol.
- **Subject:** "AI-assisted Communication Framework for Self-Driving Vehicles."

*Co-Advisors:* Prof Robert Piechocki, Dr Raul Santos-Rodriguez.

2018 (6 Months) **Matthew Uppington**, *Final Year Project*, BSc in Engineering Mathematics, University of Bristol.
- **Subject:** "Anomaly Detection Mechanisms for Cooperative Autonomous Vehicles."

*Co-Advisors:* Prof Robert Piechocki.

2018 (6 Months) **Panagis Artoumas**, *Erasmus+ Research Intern*, Department of Information Technology, International Hellenic University.
- **Subject:** "Enabling Full-Stack City-Scale Simulations for Connected and Autonomous Vehicles."

*Co-Advisors:* Prof Robert Piechocki, Prof Periklis Chatzimisios.

2016 (5 Months) **Yu (Teresa) Bi**, *MSc Project*, MSc in Communication Networks, University of Bristol.
- **Subject:** "Acquisition and Broadcasting of Enhanced Vehicle Positioning Information via a Linux-Based System."

*Co-Advisors:* Prof Robert Piechocki, Dr Andrea Tassi.

2016 (5 Months) **Xiaoyu Ye**, *MSc Project*, MSc in Communication Networks, University of Bristol.
- **Subject:** "Reducing the Interference of Vehicular Communications."

*Co-Advisors:* Prof Robert Piechocki, Dr Andrea Tassi.

## Languages

**English**: Fluent, **Greek**: Native Speaker, **German**: Conversational, **Spanish**: Basic Level

## Volunteering

- Industrial Mentoring Scheme for the Faculty of Engineering of the University of Bristol.
- Technical Program Committee member for several conferences.
- Organisation of the annual "CDT in Communications" conferences.
- Organisation of outreach activities of the University of Bristol for post-16 year old pupils.
- Organisation of Media Days and Public Events for FLOURISH and VENTURER projects.
- SYMβIOSIS - Journalist and event organiser: Anti-racism, multi-cultural environments for the diversity of humans.

## Interests & Hobbies

Basketball, Cycling, Video and Photo Editing, Travelling, Sketching, Chess.

## References

**May be pleasantly given upon request...*