Luca Mottola

Curriculum vitæ et studiorum: in brief

Luca Mottola's research lab develops new technologies at the frontier of Internet of Things, including ded computing, intermittent computing, nanosatellites, and Internet-connected robots. These technologies have been downloaded 10,000+ times, been used by half a dozen companies to create new products currently running in hundreds of embedded devices around the world. Toward, Luca Mottola is the only European researcher to be granted multiple times with the ACM SigMobile Research Highlight and to ever win B Awards at multiple flagship conferences of both ACM SigMobile and ACM SigBed. He served General Chair for ACM/IEEE CPS-IoT Week 2022 (flagship event in Cyberphysical Systems and Internet of Things) and pa for ACM MOBISYS (GSS rank A+), ACM SENSYS (youngest to date, GSS rank A++), ACM/IEEE IPSN (you date, GSS rank A++), and ACM EWSN (GSS rank A). He received the ACM SENSYS Test of Time Award a Google Faculty Award winner, and an associate editor of IEEE Transactions on Mobile Computing (S ACM Transactions on Sensor Networks (Scimago Q1), and Elsevier Computer Networks (Scimago Q1). He held visiting positions at RI.SE Sweden, Uppsala University, NXP Technologies, TU Graz, and USI Luga

Research

Luca Mottola develops techniques at the intersection of algorithms, compilers, embedded systems, ar blending the investigation of the *founding principles* **with their** *concrete application*. **The research work is fed by** *ciplinary collaborations* **within and beyond computer science and engineering, including medical sciences, engineering, civil engineering, archaeology, industrial design, and social sciences. Key indicators are**

- *123 peer-reviewed publications*, **including:**
  - *26 journal articles*, **including 16 ACM/IEEE Transactions and 18 Scimago Q1 articles: 2 CACM, 2 IE 1 IEEE COMM, 5 ACM TOSN, 4 IEEE TMC, 2 ACM CSUR, 3 ACM TECS, 1 COMPCOMM, 1 SPIE S**
  - *42 papers at conferences with GSS rank A++/A+/A*, **including 2 MOBICOM, 2 MOBISYS, 9 IPSN (1 single author), 7 SENSYS, 2 ICSE, 2 SRDS, 3 LCTES, 1 Percom, 1 Middleware, 12 EWSN, 1 BPM.**
- *1 patent application*, **together with Ericsson AB.**

Key *bibliometrics* **indicators report (first published paper in 2006):**

- *Google Scholar*: **7400+ citations, H index is 43.**
- *Scopus*: **2900+ citations, H index is 26.**
- *CSRanking.org [2021-2011]*: **first faculty at Politecnico under "Systems", fourth faculty in Italy under "Sy**
- *Scival Field-weighted Citation Impact:* **2.14 (Politecnico CS division as a whole: 1.23)**

Luca Mottola's research output is *internationally recognized*:

- *Awards to single publications*: **Best Paper Award IEEE RTCSA 2023 ACM SENSYS Test of Time Award 202 SigMobile Research Highlight 2021, Best Paper Award ACM ENSSYS 2020, Best Paper Award ACM 2020, Best Paper Award ACM VLCS 2017, ACM SigMobile Research Highlight 2017, Best Paper Av MOBISYS 2016, Best Paper Award ACM DRONET 2016, Best Paper Award ACM/IEEE IPSN 2011, B Award ACM/IEEE IPSN 2009, Best Demo ACM SENSYS 2007.**
- *Individual awards and recognition*: **Google Faculty Award 2015, Panel Member at the "Safe and Secure IoT at House of Lords - UK Parliament, ERC CoG, ERC Cor Bayeen Award 2011, Postscapes' IoT Top 100 Thinkers 2012 and 2011, EWSN/CONET Best European Ph.D. Thesis Award 2009.**
- *Industrial recognition*: **Fokus Sweden 100 Most Productive Researchers in Mathematics, Computer Sci Technology 2019, Hot Topics' Top 50 EMEA Cloud Climbers 2018.**
- *Runner-ups*: **Best Paper Candidate ACM EWSN 2020, Paper Candidate ACM SENSYS 2019, Paper Candidate ACM MOBISYS 2019, Best Demo Runner-up ACM SENSYS 2018, Paper Runner-up ACM/-IEEE IPSN 2012, Best Paper Candidate IEEE SRDS 2009.**

Funding

Luca Mottola has a track record of succeeding in competitive funding calls. In funding to date. The interdisciplinary nature of his research work allows him to join forces with researchers of other discip to funding opportunities that would be otherwise out of reach. Recent successful applications include

- *Digital Futures "Drone Arena"* **(€130K over 2 years, main applicant, project coordinator). The Digital Futures Drone Arena is a concrete and conceptual platform for interdisciplinary investigations at the inte social sciences, mobile robotics, autonomous systems, machine learning, and human-computer interaction. Social scientists from Stockholm University, Sweden are part of the project team.**

- *SSF "ASSIST"* (€600K over 5 years, co-applicant, co-PI). As society and industry face the challenge to IoT systems with the highest levels of security and safety, novel techniques are needed to detect and remove security vulnerabilities in IoT software, ensure that security protocols provide guaranteed functio as detect and mitigate intrusions when they occur.
- *SSF "ZeroIoT"* (€600K over 5 years, co-applicant, co-PI). We combine ultra-low power backscatter wireless communications and energy-driven intermittent computing through hardware/software co-design. Scientists from Uppsala University Medical School are partner in the project to design implantabl efficient sensors to diagnose Sarcopenia and Osteopenia diseases.

Technology Transfer

Luca Mottola's research is impacting the open-source domain, enabling novel real-world applications, the basis of new products. His visiting position at RI.SE Research Institutes AB offers a stepping stone for tional collaborations with industry and the public sector. Table 1 summarizes these efforts. Key exam

- HarvOS [65] enabled the longest-running deployment to date of energy-harvesting embedded sens underground archaeological site of the *Mithræum of Circus Maximus* [56]. This system is running *self-sustained* for almost four years by now.
- Reactive control [67] is part of the experimental branch of Cleanflight and is used by two start-up create new products. Luca Mottola is Scientific Advisor and Advisory Board Member of Airpelago
- The low-power wireless bus communication architecture [79] is used by two start-up companies t products. Luca Mottola is Scientific Advisor and Advisory Board Member of Sonas JP.
- The announcement layer [86] is part of the Contiki and Contiki-NG IoT operating systems and sits of their IPv6 network stacks. Contiki and Contiki-NG have been downloaded 10,000+ times to date. Two companies sell products and services using either operating system.
- Ten years after the original paper [87], Squirrel is deployed on a nano-satellite orbiting for four mo NXP technologies invites Luca Mottola to help port Squirrel to the nano-satellite. The experience is worth a Best Paper Award at ACM MOBICOM 2020 and the ACM SigMobile Research Highlight in 2021.

Research	Open-source	Actual real-world deployment	New products	Participation to start-ups
FlyZone [61]		Four different installations across US and EU		
HarvOS [65]		Mithræum of Circus Maximus [56]		
Reactive Control [67]	Part of CleanFlight exp branch, 600+ cumulative downloads	Vodafone 5G BVLoS trials	ItalDrone, AirPelago AB	Scientific Advisor and Board Member at Airpelago AB
Voltron [72]	Stand-alone distribution, 200+ cumulative downloads	Photogrammetry at the Domus dei Putti Danzanti [72]		
Low-power Wireless Bus [79]	Stand-alone distribution, 500+ cumulative downloads		Sonas JP, RedNodeLabs	Scientific Advisor and Board Member at Sonas JP
pTunes [82]	Stand-alone distribution, 200+ cumulative downloads			
Announcement Layer [86]	Part of Contiki and Contiki-NG, 10,000+ cumulative downloads		ThingSquare, Tyndall Networks	
Squirrel [87]	Part of Contiki and Contiki-NG, 10,000+ cumulative downloads	Nano-satellite NANO1 [58, 5]		
Logical Neighborhoods [104]		Torre Aquila [92], Adaptive lighting in road tunnels [85]	European patent EP2224308 (Siemens Italy)	

Table 1: Summary of technology transfer activities and impact.

Teaching

Luca Mottola's teaching activity is three-pronged, as it targets young researchers and (under-)graduat combines traditional teaching with the careful application of novel teaching methods. Key efforts incl

- Multiple scientific tutorials on topics ranging from the design of cyberphysical systems to transie computing and sensor network programming. Over the years, about 300 researchers, students, and practition ers attended Luca Mottola's tutorials at flagship scientific venues including ACM FSE (GSS rank A PLDI (GSS rank A++), ACM/IEEE CPS-IoT Week, and ACM EWSN (GSS rank A).
- The IoT Software course material he developed over the years and made publicly available (https://www.iotsoftware.net neslab.it) under CC BY-NC 4.0 is in use in 35+ (under)graduate courses, including the University bridge (UK), University College London (UK), Shanghai Jiao Tong University (China), University of (Hong Kong), University of Virginia (US), University of Southern California (US), and KTH (Sweden
- He is the creator and driving force of the 64K Computer Club (www.64kcomputer.club), together with Po- lifactory (Industrial Design, Politecnico di Milano). 64K represents a new teaching approach to foster the dent's creativity at the intersection of computer science and industrial design. 64K students reached 2nd place in the 2017 Maker championship and obtained the ACM SENSYS Best Demo Runner-up.

Teaching Activities

Ph.D. Supervision

- 2014-present: *Naveed Bhatti*, Politecnico di Milano (Italy). Thesis topic: "System Architecture Directions for Perpetual Sensing", expected graduation beginning 2018.
- 2012-present: *Ambuj Varshney*, Uppsala University (Sweden), co-advised with Thiemo Voigt. Thesis topic: "Low-power Wireless Networking with Directional Antennas", expected graduation end of 2017.
- 2012-2016: *Mikhail Afanasov*, Politecnico di Milano (Italy). Thesis topic: "Software-level Adaptation in Cyberphysical Systems".

Ph.D. Defenses

- Sain Saginbekov, Warwick University, viva defense January 2014. Thesis: "Efficient and Reliable Communication in Wireless Sensor Networks". Main examiner.
- Hjalmar Wennerström, Uppsala University, licentiate graduation December 2013. Thesis: "Environmental Effects and Transmission Errors in Outdoor Wireless Sensor Networks". Main opponent.
- Federico Ferrari, ETH Zürich, graduated October 2013. Thesis: "Enabling Dependable Communication in Cyber-Physical Systems with a Wireless Bus". Co-examiner.

M.Sc. and B.Sc. Thesis Supervision

- K. Dolui, *Cloud Platforms for the Internet of Things: How Do They Stack Up in a Real-world Application?*, Master Thesis, Politecnico di Milano (Italy), 2016.
- N. Casamassima, *Reactive Programming for Resource-limited devices*, Master Thesis, Politecnico di Milano (Italy), 2016.
- D. Cantoni, *System Support for Internet-connected Drones*, Master Thesis, Politecnico di Milano (Italy), 2015.
- A. Patelli, *Model-based Testing of Aerial Drones Control Firmwares*, Master Thesis, Politecnico di Milano (Italy), 2015.
- E. Bregu, *Re-engineering of Aerial Drone Autopilot Firmware with Reactive Programming*, Master Thesis, Politecnico di Milano (Italy), 2015.
- M. Belgioioso and A. Cardellini, *Programming of Sensing and Actuating Micro-drone Teams*, Master Thesis, Politecnico di Milano (Italy), 2015.
- T. Brucker Kambo, *CoAP Interfaces for Low-level Aerial Drone Control*, Master Thesis, Politecnico di Milano (Italy), 2014.
- M. Moretta, *Towards Service-oriented Interfaces for Aerial Drones*, Master Thesis, Politecnico di Milano (Italy), 2014.
- D. Nigatu Mitiku and M. Esayas Getachew, *Data Processing Algorithms in Wireless Sensor Networks for Structural Health Monitoring*, Master Thesis, Swedish Institute of Computer Science and Blekinge Tekniska Hogskola (BTH) (Sweden), 2011.
- V. Marioli, *Towards Virtual Synchrony in Wireless Sensor Networks*, Master Thesis, Swedish Institute of Computer Science and University of Pisa (Italy), 2011.
- B. Silase Geletu, *Modelling an Electronically Switchable Directional Antenna for Wireless Sensor Networks*, Master Thesis, Swedish Institute of Computer Science and Blekinge Tekniska Hogskola (BTH) (Sweden), 2010.
- C. Olsson, *Programming Disconnected Operations in Wireless Sensor Networks*, Master Thesis, Swedish Institute of Computer Science and Kungliga Tekniska Högskolan (KTH) (Sweden), 2009.
- E. Öström, *Building and Experimentally Evaluating a Smart Antenna for Low-power Wireless Communication*, Master Thesis, Swedish Institute of Computer Science and Mälardalen University (Sweden), 2009.
- M. Zimmerling, *Automatic Parameter Optimization of Sensor Network MAC Protocols*, Master Thesis (co-supervised with Thiemo Voigt), Swedish Institute of Computer Science and Technische Universität Dresden (Germany), 2009. *Best M.Sc. Thesis Award* at the 1st International School on Cyber-Physical and Sensor Networks (SensorNets), Monastir (Tunisia), December 2009.
- F. Pompermaier, *Accurate Estimation of Residual Lifetime in WSNs*, Master Thesis, University of Trento (Italy), 2008.
- G. Khasanova, *High-level Programming of WSNs Using Distributed Abstract Data Types*, Master Thesis, University of Trento (Italy), 2008.
- E. Bisoffi, *Understanding Over-the-air Reprogramming in WSNs: A Case Study with the Deluge Protocol*, Master Thesis, University of Trento (Italy), 2008.
- C. Benoni, *Time Synchronization for the TeenyLIME Middleware*, Bachelor Thesis, University of Trento (Italy), 2007.

- A. Amjad, *Routing for Fine-Grained Code Deployment in Sensor Networks*, Master Thesis, University of Trento (Italy), 2007.
- G. Pedrazza, *A Comparative Analysis of MANETs Simulators*, Master Thesis, Politecnico di Milano (Italy), 2007.
- G. Gerosa, *Analyzing Temporal Aspects in the Automated Verification of Publish-Subscribe Architectures*, Master Thesis, Politecnico di Milano (Italy), 2007.
- A. Ungari, *Code Deployment in Heterogeneous Wireless Sensor Networks*, Master Thesis, Politecnico di Milano (Italy), 2006.
- P. Ciciriello, *Routing to Multiple Sinks in Wireless Sensor Networks*, Master Thesis, Politecnico di Milano, 2006.
- A. Bellerno, *Design and Implementation of a Tool for Monitoring Sensor Network Deployments*, Bachelor Thesis, Politecnico di Milano (Italy), 2006.
- G. Turconi and D. Sormani, *Probabilistic Routing in Vehicular Networks*, Bachelor Thesis, Politecnico di Milano (Italy), 2006.

Courses

Main lecturer for the following courses:

- Fall 2017 - Politecnico di Milano, Italy:
  - *Software Engineering* (undergraduate course).
  - *Middleware Technologies* (graduate course).
- Spring 2017 - Politecnico di Milano, Italy:
  - *Software Engineering* (undergraduate course).
  - *Final Project* (undergraduate course).
  - *Software Project* (undergraduate course).
  - *Computer Science Fundamentals* (undergraduate course).
- Fall 2016 - Politecnico di Milano, Italy:
  - *Software Engineering II* (graduate course).
- Spring 2016 - Politecnico di Milano, Italy:
  - *Software Engineering* (undergraduate course).
  - *Final Project* (undergraduate course).
  - *Software Project* (undergraduate course).
- Fall 2015 - University of Trento, Italy:
  - *Networked Embedded Software* (Ph.D. course).
- Spring 2015 - Gran Sasso Science Institute (GSSI) International Ph.D. school, Italy:
  - *Networked Embedded Software* (Ph.D. course).
- Spring 2015 - Politecnico di Milano, Italy:
  - *Networked Embedded Software* (Ph.D. course).
- Spring 2015 - Graz University of Technology, Austria:
  - *Networked Embedded Software* (Ph.D. course).
- Fall 2014 - Politecnico di Milano, Italy:
  - *Computer Science Fundamentals* (undergraduate course).
- Spring 2014 - Politecnico di Milano, Italy:
  - *Smart Buildings and Structures: a Cyberphysical System Perspective* (Ph.D. course).
- Spring 2014 - Politecnico di Milano, Italy:
  - *Software Project* (undergraduate course).
- Fall 2013 - Politecnico di Milano, Italy:
  - *Software Engineering II* (graduate course).
- Fall 2012 - Politecnico di Milano, Italy:
  - *Software Engineering II* (graduate course).
- Fall 2010 - Kungliga Tekniska Högskolan (KTH), Sweden:

- *Programming Wireless Sensor Networks: A System Perspective* (graduate course).

- Spring 2008 - Politecnico di Milano - CEFRIEL, Italy:
  - *Introduction to Middleware* (graduate course).
- Fall 2007 - Politecnico di Milano - CEFRIEL, Italy:
  - *Introduction to Middleware* (graduate course)
- Spring 2007 - Politecnico di Milano - CEFRIEL, Italy:
  - *Introduction to Middleware* (graduate course).

Guest lecturer for the following courses and schools:

- Summer 2011 - Bertinoro, Italy:
  - *International CONET Summer School: Networked Embedded Systems: Humans in the Loop* (school).
- Spring 2011 - Politecnico di Milano, Italy:
  - *Advanced Topics in Software Engineering* (graduate course).
- Spring 2011 - Uppsala University, Sweden:
  - *Data Communication Networks III* (graduate course).
- Fall 2010 - Uppsala University, Sweden:
  - *Distributed Information Systems* (undergraduate course).
- Spring 2010 - Uppsala University, Sweden:
  - *Data Communication Networks III* (graduate course).
- Fall 2009 - Monastir, Tunisia:
  - *International School on Cyber-Physical and Sensor Networks (SensorNets)* (school).
- Fall 2009 - Uppsala University, Sweden:
  - *Distributed Information Systems* (undergraduate course).
- Fall 2009 - Kungliga Tekniska Högskolan (KTH), Sweden:
  - *Principles of Wireless Sensor Networks* (graduate course).
- Summer 2009 - Bertinoro, Italy:
  - *International CONET Summer School: from Sensor Networks to Networked Intelligent Objects* (school).
- Fall 2008 - L'Aquila, Italy:
  - *GII Doctoral School in Computer Engineering* (school).

Teaching assistant for the following courses:

- Spring 2008 - University of Trento, Italy:
  - *Programming Wireless Sensor Networks* (in English - Ph.D. course taught by Prof. Gian Pietro Picco).
- Fall 2007 - University of Trento, Italy:
  - *Middleware and Application-Level Protocols* (in English - graduate course taught by Prof. Gian Pietro Picco).
- Fall 2006 - Politecnico di Milano, Italy:
  - *Distributed Computing Systems* (graduate course taught by Prof. Gian Pietro Picco).
  - *Programming Fundamentals I* (undergraduate course taught by Prof. Dino Mandrioli).
- Spring 2006 - Politecnico di Milano, Italy:
  - *Distributed Computing Systems* (in English - graduate course taught by Prof. Gian Pietro Picco).
  - *Theoretical Computer Science I* (undergraduate course taught by Prof. Matteo Pradella).
- Spring 2005 - Politecnico di Milano, Italy:
  - *Theoretical Computer Science I* (undergraduate course taught by Prof. Matteo Pradella).

Publications[2]

International Journals

[1] Mikhail Afanasov, Luca Mottola, and Carlo Ghezzi. Software Adaptation in Wireless Sensor Networks. (To appear) in *ACM Transactions on Autonomous and Adaptive Systems*.

[2] Marco Zimmerling, Luca Mottola, Pratyush Kumar, Federico Ferrari, and Lothar Thiele. Adaptive Real-time Communication for Wireless Cyber-physical Systems. In *ACM Transactions on Cyber-physical Systems*. Volume 1, Issue 2. February 2017.

[3] Laura Stefanizzi, Luca Mottola, Luca Mainetti, and Luigi Patrono. COIN: Opening the Internet of Things to People's Mobile Devices. In *IEEE Communications - Special Issue on People-centric Internet of Things*. Volume 55, Issue 2. February 2017.

[4] Naveed Bhatti, Hamad Alizai, Affan Syed, and Luca Mottola. Energy Harvesting and Wireless Transfer in Sensor Network Applications: Concepts and Experiences. In *ACM Transactions on Sensor Networks*, Volume 12, Issue 3. August 2016.

[5] Arshad Jhumka and Luca Mottola. View Consistency in Wireless Sensor Networks. In *ACM Transactions on Sensor Networks*, Volume 12, Issue 3. August 2016.

[6] Alessandro Sivieri, Luca Mottola, and Gianpaolo Cugola. Building Internet of Things Software with ELIoT. In *International Journal on Computer Communications - Special Issue on Internet of Things: Research challenges and Solutions*, Volume 89-90. September 2016.

[7] Stefan Guna, Luca Mottola, and Gian Pietro Picco. DICE: Monitoring Global Invariants of Physical Processes using Wireless Sensor Networks. In *ACM Transactions on Sensor Networks*, Volume 10, Issue 4. June 2014.

[8] Prasant Misra, Luca Mottola, Shahid Raza, Simon Duquennoy, Nicolas Tsiftes, Joel Hoglund, and Thiemo Voigt. Supporting Cyberphysical Systems with Wireless Sensor Networks: An Outlook of Software and Services. In *Journal of the Indian Institute of Science (publishing since 1914) - Special Issue on Cyberphysical Systems*, Volume 93, Issue 3. September 2013.

[9] Nouha Baccour, Anis Koubaa, Luca Mottola, Marco Zuniga, Habib Youssef, Carlo Alberto Boano, and Mario Alves. Radio Link Quality Estimation in Wireless Sensor Networks: a Survey. In *ACM Transactions on Sensor Networks*, Volume 8, Issue 4. November 2012.

[10] Luca Mottola and Gian Pietro Picco. Middleware for Wireless Sensor Networks: An Outlook. In *Journal of Internet Services and Application*, Volume 3, Issue 1. May 2012.

[11] Luca Mottola and Gian Pietro Picco. MUSTER: Adaptive Energy-Aware Multi-Sink Routing in Wireless Sensor Networks. In *IEEE Transactions on Mobile Computing*, Volume 10, Issue 12. December 2011.

[12] Luciano Baresi, Carlo Ghezzi, and Luca Mottola. Loupe: Verifying Publish-Subscribe Architectures with a Magnifying Lens. In *IEEE Transactions on Software Engineering*, Volume 37, Issue 2. April 2011.

[13] Luca Mottola and Gian Pietro Picco. Programming Wireless Sensor Networks: Fundamental Concepts and State of the Art. In *ACM Computing Surveys*, Volume 43, Issue 3. April 2011.

[14] Luca Mottola, Gian Pietro Picco, Matteo Ceriotti, Stefan Guna, and Amy L. Murphy. Not All Wireless Sensor Networks Are Created Equal: A Comparative Study On Tunnels. In *ACM Transactions on Sensor Networks*, Volume 7, Issue 2. August 2010.

[15] Daniele Zonta, Huayong Wu, Matteo Pozzi, Paolo Zanon, Matteo Ceriotti, Luca Mottola, Gian Pietro Picco, Amy L. Murphy, Stefan Guna, and Michele Corrà. Wireless Sensor Networks for Permanent Health Monitoring of Historic Constructions. In *SPIE International Journal on Smart Structures and Systems. Special Issue on Wireless Sensor Advances and Applications for Civil Infrastructure Monitoring*. Volume 6, Issue 5-6. June 2010.

[16] Luca Mottola, Gianpaolo Cugola, and Gian Pietro Picco. A Self-Repairing Tree Topology Enabling Content-Based Routing in Mobile Ad-hoc Networks. In *IEEE Transactions on Mobile Computing*, Volume 7, Issue 8. August 2008.

[17] Paolo Costa, Geoff Coulson, Cecilia Mascolo, Luca Mottola, Gian Pietro Picco and Stefanos Zachariadis. A Reconfigurable Component-Based Middleware of Networked Embedded Systems. In *International Journal of Wireless Information Networks*, Volume 14, Issue 2. June 2007. Springer Press.

[2] The standard ordering of authors in Italy is alphabetical.

Authored Books

[18] Nouha Baccour, Anis Koubaa, Luca Mottola, Claro Noda, Hossein Fotouhi, Mario Alves, Hossein Youssef, Marco Zuniga, Carlo Alberto Boano, Kay Roemer, Daniele Puccinelli, and Thiemo Voigt. *Radio Link Quality Estimation in Low-power Wireless Networks*, Part of the SpringerBriefs in Cooperating Objects, July 2013, Springer Press.

Edited Books

[19] Koen Langendoen, Wen Hu, Federico Ferrari, Marco Zimmerling, and Luca Mottola. *Proceedings of the 5th Workshop on Real-world Wireless Sensor Networks (REALWSN)*, Como Lake (Italy), September 2013, Springer Press.

[20] Stamatis Karnouskos, Pedro Marron, Giancarlo Fortino, Luca Mottola, and Luis Martinez-de Dios. *The Emerging Domain of Cooperating Objects: Applications and Markets*, Part of the SpringerBriefs in Cooperating Objects, July 2013, Springer Press.

[21] Kurth Geihs, Luca Mottola, Gian Pietro Picco, and Kay Roemer. *Proceedings of the 2nd Workshop on Software Engineering for Sensor Network Applications (SESENA - colocated with ICSE)*, Waikiki (USA), May 2011, IEEE Press.

[22] Pedro J. Marron, Thiemo Voigt, Peter Corke, and Luca Mottola. *Proceedings of the 4th Workshop on Real-world Wireless Sensor Networks (REALWSN)*, Colombo (Sri Lanka), December 2010, Springer Press.

Contributions to Books

[23] Luca Mottola and Thiemo Voigt. From Smart Dust to Wireless Sensor Networks. Foreword to: *Wireless Sensor Networks: Deployments and Design Frameworks*. Elena Gaura, Michael Allen, Lewis Girod, James Brusey, and Geoffrey Werner-Challen eds., Springer Press, 2010.

[24] Paolo Costa, Luca Mottola, Amy L. Murphy, and Gian Pietro Picco. Tuple Space Middleware for Wireless Networks. Invited chapter in: *Middleware for Network Eccentric and Mobile Applications*. Benoit Gabinato, Hugo Miranda, and Louis Rodrigues eds., Springer Press, 2008.

International Magazines

[25] Luca Mottola, Niklas Wirstrom, and Thiemo Voigt. Building Systems of Aerial Drones. In *ERCIM News - Special Theme "Cyberphysical Systems"*. Number 97, 2014.

[26] Luca Mottola. Wireless Sensor Networks and the Tower that Breathes. Invited article as follow-up to the *Cor Baseen Award* ceremony, in *ERCIM News*. Number 88, 2011.

International Conferences

[27] Naveed Bhatti and Luca Mottola. HarvOS: Efficient Code Instrumentation for Transiently-powered Embedded Devices. In *Proceedings of the 16th ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN - part of CPSWEEK)*, Pittsburg (PA, US), April 2017.

[28] Giovanni Tarter, Luca Mottola, and Gian Pietro Picco. Directional Antennas for Convergecast in Wireless Sensor Networks: Are They a Good Idea?. In *Proceedings of the 13th IEEE International Conference on Mobile Ad-hoc and Sensor Systems (MASS)*, Brasilia (Brasil), October 2016.

[29] Endri Bregu, Nicola Casamassima, Daniel Cantoni, Luca Mottola, and Ramin Whitehouse. Reactive Control of Autonomous Drones. In *Proceedings of the 14th ACM International Conference on Mobile Systems, Applications, and Services (MOBISYS)* Singapore, June 2016. *Best Paper Award*.

[30] Naveed Bhatti and Luca Mottola. Efficient State Retention for Transiently-powered Embedded Sensing. In *Proceedings of the 13th ACM International Conference on Embedded Wireless Systems and Networks (EWSN)* Graz (Austria), February 2016.

[31] Mathieu Michel, Luca Mottola, Nicolas Tsiftes, and Thiemo Voigt. Predictable MAC-level Performance in Low-power Wireless under Interference. In *Proceedings of the 13th ACM International Conference on Embedded Wireless Systems and Networks (EWSN)* Graz (Austria), February 2016.

[32] Andrea Azzará and Luca Mottola. Virtual Resources for the Internet of Things. In *Proceedings of the IEEE World Forum on Internet of Things (WF-IoT)* Milano (Italy), December 2015.

[33] Ambuj Varshney, Luca Mottola, Mats Carlsson, and Thiemo Voigt. Directional Transmissions and Receptions for High-throughput Bulk Forwarding in Wireless Sensor Networks. In *Proceedings of the 13th ACM International Conference on Embedded Networked Sensor Systems (SENSYS)*, Seoul (South Korea), November 2015.

[34] Luca Mottola, Mattia Moretta, Kamin Whitehouse, and Carlo Ghezzi. Team-level Programming of Drone Sensor Networks. In *Proceedings of the 12th ACM International Conference on Embedded Networked Sensor Systems (SENSYS)*, Memphis (TN, US), November 2014.

[35] Mikhail Afanasov, Luca Mottola, and Carlo Ghezzi. Context-oriented Programming for Adaptive Wireless Sensor Network Software. In *Proceedings of the 10th IEEE International Conference on Distributed Computing in Sensor Systems (DCOSS)*, Marina del Rey (CA, USA), May 2014.

[36] Federico Ferrari, Marco Zimmerling, Luca Mottola, and Lothar Thiele. Virtual Synchrony Guarantees for Cyber-physical Systems. In *Proceedings of the 32nd IEEE International Symposium on Reliable Distributed Systems (SRDS)*, Braga (Portugal), October 2013.

[37] Marco Zimmerling, Federico Ferrari, Luca Mottola, and Lothar Thiele. On Modeling Low-power Wireless Protocols Based on Synchronous Packet Transmissions. In *Proceedings of the 21st IEEE International Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems (MASCOTS)*, San Francisco (CA, USA), August 2013.

[38] Florian Daniel, Joakim Eriksson, Niclas Finne, Harald Fuchs, Andrea Gaglione, Stamatis Karnouskos, Patricio Moreno Montero, Luca Mottola, Felix Jonathan Oppermann, Gian Pietro Picco, Kay Roemer, Patrik Spiess, Stefano Tranquillini, and Thiemo Voigt. makeSense: Real-world Business Processes through Wireless Sensor Networks. In *Proceedings of the 4th International Workshop on Networks of Cooperating Objects for Smart Cities (CONET/UBICITEC - part of CPSWEEK)*, Philadelphia (PA, USA), April 2013.

[39] Luca Mottola, Thiemo Voigt, and Gian Pietro Picco. Electronically-switched Directional Antennas for Wireless Sensor Networks: A Full-stack Evaluation. In *Proceedings of the 10th International Conference on Sensing, Communication, and Networking (SECON)*, New Orleans (LO, USA), June 2013.

[40] Thiemo Voigt, Luca Mottola, and Kasun Hewage. Understanding Link Dynamics in Wireless Sensor Networks with Dynamically Steerable Directional Antennas. In *Proceedings of the 10th European Conference on Wireless Sensor Networks (EWSN)*, Ghent (Belgium), February 2013.

[41] Federico Ferrari, Marco Zimmerling, Luca Mottola, and Lothar Thiele. Low-power Wireless Bus. In *Proceedings of the 10th ACM International Conference on Networked Sensing Systems (SENSYS)*, Toronto (Canada), November 2012.

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Luca Mottola

Curriculum vitæ et studiorum: in brief

Luca Mottola's research lab develops new technologies at the frontier of Internet of Things, including ded computing, intermittent computing, nanosatellites, and Internet-connected robots. These technologies have been downloaded 10,000+ times, been used by half a dozen companies to create new products currently running in hundreds of embedded devices around the world. Toward, Luca Mottola is the only European researcher to be granted multiple times with the ACM SigMobile Research Highlight and to ever win B Awards at multiple flagship conferences of both ACM SigMobile and ACM SigBed. He served General Chair for ACM/IEEE CPS-IoT Week 2022 (flagship event in Cyberphysical Systems and Internet of Things) and pa for ACM MOBISYS (GSS rank A+), ACM SENSYS (youngest to date, GSS rank A++), ACM/IEEE IPSN (you date, GSS rank A++), and ACM EWSN (GSS rank A). He received the ACM SENSYS Test of Time Award a Google Faculty Award winner, and an associate editor of IEEE Transactions on Mobile Computing (S ACM Transactions on Sensor Networks (Scimago Q1), and Elsevier Computer Networks (Scimago Q1). He held visiting positions at RI.SE Sweden, Uppsala University, NXP Technologies, TU Graz, and USI Luga

Research

Luca Mottola develops techniques at the intersection of algorithms, compilers, embedded systems, ar blending the investigation of the *founding principles* **with their** *concrete application*. **The research work is fed by** *ciplinary collaborations* **within and beyond computer science and engineering, including medical sciences, engineering, civil engineering, archaeology, industrial design, and social sciences. Key indicators are**

- *123 peer-reviewed publications*, **including:**
  - *26 journal articles*, **including 16 ACM/IEEE Transactions and 18 Scimago Q1 articles: 2 CACM, 2 IE 1 IEEE COMM, 5 ACM TOSN, 4 IEEE TMC, 2 ACM CSUR, 3 ACM TECS, 1 COMPCOMM, 1 SPIE S**
  - *42 papers at conferences with GSS rank A++/A+/A*, **including 2 MOBICOM, 2 MOBISYS, 9 IPSN (1 single author), 7 SENSYS, 2 ICSE, 2 SRDS, 3 LCTES, 1 Percom, 1 Middleware, 12 EWSN, 1 BPM.**
- *1 patent application*, **together with Ericsson AB.**

Key *bibliometrics* **indicators report (first published paper in 2006):**

- *Google Scholar*: **7400+ citations, H index is 43.**
- *Scopus*: **2900+ citations, H index is 26.**
- *CSRanking.org [2021-2011]*: **first faculty at Politecnico under "Systems", fourth faculty in Italy under "Sy**
- *Scival Field-weighted Citation Impact:* **2.14 (Politecnico CS division as a whole: 1.23)**

Luca Mottola's research output is *internationally recognized*:

- *Awards to single publications*: **Best Paper Award IEEE RTCSA 2023 ACM SENSYS Test of Time Award 202 SigMobile Research Highlight 2021, Best Paper Award ACM ENSSYS 2020, Best Paper Award ACM 2020, Best Paper Award ACM VLCS 2017, ACM SigMobile Research Highlight 2017, Best Paper Av MOBISYS 2016, Best Paper Award ACM DRONET 2016, Best Paper Award ACM/IEEE IPSN 2011, B Award ACM/IEEE IPSN 2009, Best Demo ACM SENSYS 2007.**
- *Individual awards and recognition*: **Google Faculty Award 2015, Panel Member at the "Safe and Secure IoT at House of Lords - UK Parliament, ERC Cor Bayeen Award 2011, Postscapes' IoT Top 100 Thinkers 2012 and 2011, EWSN/CONET Best European Ph.D. Thesis Award 2009.**
- *Industrial recognition*: **Fokus Sweden 100 Most Productive Researchers in Mathematics, Computer Sci Technology 2019, Hot Topics' Top 50 EMEA Cloud Climbers 2018.**
- *Runner-ups*: **Best Paper Candidate ACM EWSN 2020, Paper Candidate ACM SENSYS 2019, Paper Candidate ACM MOBISYS 2019, Best Demo Runner-up ACM SENSYS 2018, Paper Runner-up ACM/-IEEE IPSN 2012, Best Paper Candidate IEEE SRDS 2009.**

Funding

Luca Mottola has a track record of succeeding in competitive funding calls. In funding to date. The interdisciplinary nature of his research work allows him to join forces with researchers of other discip to funding opportunities that would be otherwise out of reach. Recent successful applications include

- *Digital Futures "Drone Arena"* **(e130K over 2 years, main applicant, project coordinator). The Digital Futures Drone Arena is a concrete and conceptual platform for interdisciplinary investigations at the inte social sciences, mobile robotics, autonomous systems, machine learning, and human-computer interaction. Social scientists from Stockholm University, Sweden are part of the project team.**

- *SSF "ASSIST"* (€600K over 5 years, co-applicant, co-PI). As society and industry face the challenge to IoT systems with the highest levels of security and safety, novel techniques are needed to detect and remove security vulnerabilities in IoT software, ensure that security protocols provide guaranteed functio as detect and mitigate intrusions when they occur.
- *SSF "ZeroIoT"* (€600K over 5 years, co-applicant, co-PI). We combine ultra-low power backscatter wireless communications and energy-driven intermittent computing through hardware/software co-design. Scientists from Uppsala University Medical School are partner in the project to design implantabl efficient sensors to diagnose Sarcopenia and Osteopenia diseases.

Technology Transfer

Luca Mottola's research is impacting the open-source domain, enabling novel real-world applications, the basis of new products. His visiting position at RI.SE Research Institutes AB offers a stepping stone for tional collaborations with industry and the public sector. Table 1 summarizes these efforts. Key exam

- HarvOS [65] enabled the longest-running deployment to date of energy-harvesting embedded sens underground archaeological site of the *Mithræum of Circus Maximus* [56]. The system is running *self-sustained* for almost four years by now.
- Reactive control [67] is part of the experimental branch of Cleanflight and is used by two start-up create new products. Luca Mottola is Scientific Advisor and Advisory Board Member of Airpelago
- The low-power wireless bus communication architecture [79] is used by two start-up companies t products. Luca Mottola is Scientific Advisor and Advisory Board Member of Sonas JP.
- The announcement layer [86] is part of the Contiki and Contiki-NG IoT operating systems and sits of their IPv6 network stacks. Contiki and Contiki-NG have been downloaded 10,000+ times to date. Two companies sell products and services using either operating system.
- Ten years after the original paper [87], Squirrel is deployed on a nano-satellite orbiting for four mo NXP technologies invites Luca Mottola to help port Squirrel to the nano-satellite. The experience is worth a Best Paper Award at ACM MOBICOM 2020 and the ACM SigMobile Research Highlight in 2021.

Research	Open-source	Actual real-world deployment	New products	Participation to start-ups
FlyZone [61]		Four different installations across US and EU		
HarvOS [65]		Mithræum of Circus Maximus [56]		
Reactive Control [67]	Part of CleanFlight exp branch, 600+ cumulative downloads	Vodafone 5G BVLoS trials	ItalDrone, AirPelago AB	Scientific Advisor and Board Member at Airpelago AB
Voltron [72]	Stand-alone distribution, 200+ cumulative downloads	Photogrammetry at the Domus dei Putti Danzanti [72]		
Low-power Wireless Bus [79]	Stand-alone distribution, 500+ cumulative downloads		Sonas JP, RedNodeLabs	Scientific Advisor and Board Member at Sonas JP
pTunes [82]	Stand-alone distribution, 200+ cumulative downloads			
Announcement Layer [86]	Part of Contiki and Contiki-NG, 10,000+ cumulative downloads		ThingSquare, Tyndall Networks	
Squirrel [87]	Part of Contiki and Contiki-NG, 10,000+ cumulative downloads	Nano-satellite NANO1 [58, 5]		
Logical Neighborhoods [104]		Torre Aquila [92], Adaptive lighting in road tunnels [85]	European patent EP2224308 (Siemens Italy)	

Table 1: Summary of technology transfer activities and impact.

Teaching

Luca Mottola's teaching activity is three-pronged, as it targets young researchers and (under-)graduat combines traditional teaching with the careful application of novel teaching methods. Key efforts incl

- Multiple scientific tutorials on topics ranging from the design of cyberphysical systems to transie computing and sensor network programming. Over the years, 300+ researchers, students, and practition ers attended Luca Mottola's tutorials at flagship scientific venues including ACM FSE (GSS rank A PLDI (GSS rank A++), ACM/IEEE CPS-IoT Week, and ACM EWSN (GSS rank A).
- The IoT Software course material he developed over the years and made publicly available (https://www.iotsoftware.net neslab.it) under CC BY-NC 4.0 is in use in 35+ (under)graduate courses, including the University bridge (UK), University College London (UK), Shanghai Jiao Tong University (China), University of (Hong Kong), University of Virginia (US), University of Southern California (US), and KTH (Sweden
- He is the creator and driving force of the 64K Computer Club (www.64kcomputer.club), together with Po- lifactory (Industrial Design, Politecnico di Milano). 64K represents a new teaching approach to foster the dent's creativity at the intersection of computer science and industrial design. 64K students reached 2nd place in the 2017 Maker championship and obtained the ACM SENSYS Best Demo Runner-up.