

CAREER PROFILE

I received the M.Sc. Degree in Computer Engineering from the University of Genova in 2006 and the Ph.D. in Space Science and Engineering in 2012. I'm currently employed as full-time researcher at the Institute for Applied Mathematics and Information Technologies "Enrico Magenes" (IMATI) unit of Genova, of the National Research Council of Italy (CNR).

My academic education in Computer Engineering had a strong focus on networking and distributed systems, but for seven years I've been working also on real-time systems, robotics and automation.

A couple of years ago I started working on Deep Learning, mainly in the fields of Computer Vision and Time Series Forecasting. Today my research interests range from simple classification and segmentation tasks to advanced data augmentation strategies and self-supervised learning.

My technical background is extremely diverse with ten years' experience working with Linux in almost all of its main flavours and excellent coding skills, both with traditional languages such as C/C++ and scripting languages such as Python or just the Linux Bash.

EDUCATION

Ph.D. in Space Science and Engineering 2009 - 2012
University of Genova

Ph.D. in Space Science and Engineering received on 20/04/2012.
Thesis title: "DHT-based Overlay Networks applied to Pervasive Network Mobility"

M.Sc. Degree in Computer Engineering 1998 - 2006
University of Genova

M.Sc. Degree in Computer Engineering received on 24/07/2006.
Thesis title: "Studio ed analisi di modelli scalabili per la valutazione di prestazioni di reti TCP/IP ad alta velocità"

EXPERIENCES

Researcher Jan 2019 - Present
CNR-IMATI

I'm currently employed as full-time researcher at the Institute for Applied Mathematics and Information Technologies "Enrico Magenes" (IMATI) unit of Genova, of the National Research Council of Italy (CNR). My main research interest is in the field of Deep Learning for Computer Vision, where I deal with classification and segmentation tasks, also through unsupervised learning.

Temporary Researcher July 2014 - Dec 2018
CNR-ISSIA

Since July 2014 I've been employed as temporary researcher at the Institute of Intelligent Systems for Automation (ISSIA) of the National Research Council of Italy (CNR). I was part of the Field and Interaction Robotics group where I took part in important national and international research projects such as Morph (EC project),




**Andrea
Ranieri**

Researcher

 andrea.ranieri@cnr.it

 340-5895727

 andrea-
ranieri-19284b50

 aviogit

 aviogit

LANGUAGES

Italian (Native)

English (Professional)

C++ (Professional)

Python (Professional)

INTERESTS

Deep Learning

Computer Vision

Distributed Systems

Software & Languages

Caddy (EC project), Maris (an Italian PRIN project) and Secure Platform by Fincantieri (a project funded by MIT, the Italian Ministry of Infrastructure and Transport).

Fellow Researcher

July 2012 - July 2014

[CNR-ISSIA](#)

Since July 2012 I've been employed as fellow researcher at the Institute of Intelligent Systems for Automation (ISSIA) of the National Research Council of Italy (CNR). My grant was funded by a POR-FESR regional project and I've been working in tight cooperation with an Italian SME (Small-Medium Enterprise), Green Project S.r.l. In those two years I've built for them a state-of-the-art embedded real-time Linux distribution to serve as common platform for their entire fleet of heterogeneous industrial marking machines. In the last months of the grant, I also developed an Android app able to control their most sold marking machine, the Hammer, an heavy duty punching device with a single, hard metal chisel.

Fellow Researcher and Ph.D. Student

Oct 2006 - Feb 2012

[University of Genova](#)

Since July 2006 I've been part of the Telecommunication Networks and Telematics (TNT) Lab, part of the Department of Communication, Computer and System Sciences of the University of Genova. There, I worked to analyze and optimize the performance of the Linux kernel networking stack for Linux Software Routers platforms. Lately, during my Ph.D. I also, started working on power consumption analysis of Linux Software Routers and on applying known and established P2P paradigms to provide services different from plain file sharing. I've worked on Content Addressable Networks and Service-Specific Overlay Networks, and finally I've defended my Ph.D. thesis on «DHT-based Overlay Networks applied to Pervasive Network Mobility» where I implemented a MobileIPv4 equivalent using Distributed Hash Tables (DHTs - for content addressing) and IPsec tunnels for transport.

Consultant

Sep 2010 - Dec 2010

[Ericsson Telecomunicazioni S.p.a.](#)

For a short period of time I've been also working as consultant in the R&D Department at Ericsson Telecomunicazioni S.p.a. where I worked on the C++ software architecture of large and high-speed optical routing/switching devices (the OMS1410 e OMS1460 optical transport switches).

PROJECTS

Since the very beginning of my academic career I've been involved in many international and national projects, funded both by public bodies and institutions and private companies. Below you can find a (probably incomplete) list of the projects I've been involved in.

POLAR - Secure Platform - An industrial research project funded by MIT to develop an integrated robotic system (with aerial and marine drones) for the detection, tracking and rescue of people in an event of man overboard on cruise ships.

Maris - «Marine Autonomous Robotics for InterventionS», was a PRIN Italian project (Total cost: 1.798.039 EUR) to develop cooperative underwater robotic

systems for manipulation and transportation activities (e.g. in off-shore oil industry). In the final demo, a cooperating system built with one underwater vehicle, one underwater robotic arm, one underwater stereo camera and one underwater robotic hand, has successfully detected, tracked and grasped a mock-up oil pipe section in a fully autonomous setup.

Caddy - «Cognitive Autonomous Diving Buddy», was an EC FP7 project in ICT-2013.2.1 area (CP - Small or medium-scale focused research project - STREP) spanning from 2014 to 2016 (Total cost: 4.881.103 EUR). The CADDY project aimed to replace a human "buddy diver" with an autonomous underwater vehicle and to add a new autonomous surface vehicle for improved monitoring, assistance, and safety of the diver's missions.

Morph - «Marine robotic system of self-organizing, logically linked physical nodes», was an EC FP7 collaborative project in ICT-2011.2.1 area spanning from 2012 to early 2016 (Total cost: 8.521.744 EUR). The MORPH project advanced the novel concept of an underwater robotic system composed of a number of spatially separated mobile robot-modules, carrying distinct and yet complementary payloads, capabilities and sensors. Instead of being physically coupled, the modules were connected via virtual links that relied on the flow of information among them. Without rigid links, the MORPH supra-vehicle (MSV) has been able to reconfigure itself and adapt in response to the varying shape of the underwater walls.

InterMedia NoE - «Interactive Media with Personal Networked Devices», was an EC FP6 Network of Excellence in IST-2005-2.41.6 area spanning from 2006 to 2010 (Total EU contribution: 5.596.000 EUR). The InterMedia NoE's purpose was to progress beyond home and device-centric convergence toward truly user-centric convergence of multimedia. One of the main objectives of the project was to investigate a flexible wearable platform that supports dynamic composition of wearable devices, an ad-hoc connection to devices in the environment, a continuous access to multimedia networks, as well as adaptation of content to devices and user context.

ACTIVITIES & KNOWLEDGE

1. Deep Learning skills & projects

1. Followed excellent online ML/DL courses by Sentdex (Tensorflow 1.0 and Keras). Then moved to Fast.ai by Jeremy Howard to leverage the power of higher-level libraries.
2. Participation in the Kaggle challenge with title: "**LANL Earthquake Prediction**" by Los Alamos National Laboratory that aimed at training models able to predict the time remaining before a lab earthquake from just a small, arbitrary chunk of seismic data. The main ML skills acquired during this competition have been about training LSTM and LightGBM models, using cross validation and ensembles (mainly bagging) to avoid overfitting on the training set.
3. Attendance of Ph.D. course with title: "Deep Learning: a hands-on introduction" - Course organised within the Ph.D. Program in Computer Science and Systems Engineering by the University of Genoa. The main topics of the course were an introduction to Tensorflow and Keras, then basic CNN model training up to deep autoencoders and GANs.
4. Training of several real-world data classifiers like the Caddy Diver

Gestures Classifier (16 classes - 95% accuracy) to allow underwater robots to understand an extended version of the diver's language. Both training and deployment are performed with the aid of the Fast.ai library. Training is done through state of the art models, like Resnet-50/101/152, and concepts, like the one cycle policy for fitting - Demo of the **Caddy Diver Gestures Classifier** is available at [this link](http://tiny.cc/sbixaz): <http://tiny.cc/sbixaz>. Demo classifier for the **Kaggle dog breed classification challenge** is available at [this link](http://tiny.cc/ueixaz): <http://tiny.cc/ueixaz>

2. Distributed Systems and Service Specific Overlay Networks for Network Mobility

1. Study and analysis of data distribution mechanisms using Peer-to-Peer (P2P) techniques, with a particular focus on "Distributed Hash Tables" (DHTs) software structures. Popular DHTs such as Kademlia, CAN, Chord, Tapestry, etc. and their related mathematical properties have been studied mainly to understand the creation and partitioning of their virtual spaces.
2. Development of simulation tools, both at the overlay and the network level, for the performance analysis of the aforementioned DHTs. Good knowledge of NS-2/NS-3 network simulators.
3. Development of algorithms to optimize each different DHT virtual space topology in relation to the underlying IP network topology.
4. Analysis of multi-service and multi-protocol scenarios on overlay infrastructures, posing particular attention to network mobility scenarios.
5. Preliminary study of the novel Content-Centric Networking paradigm and of a possible use of multi-tiered DHT protocols, implemented by routers at network level, for this purpose.

3. Linux-based IP Software Router Architectures

1. Analysis and development of open-source SW architectures (Linux distributions) for PC-based IP Software Routers.
2. Optimization of packet forwarding processes vs. optimization of energy consumption on PC-based Software Routers.
3. Analysis, development and optimization of the Linux kernel networking capabilities, with particular focus on differences between single-core/CPU vs. SMP kernels and benchmarking of Ethernet and IPv4 protocols.
4. Development and design of innovative new generation HW/SW platforms for optimizing the Linux SW Router architecture in multi-Core/CPU environments, with particular care on NICs (Network Interface Cards) offloading capabilities (e.g. IPsec implementations in hardware, etc.).
5. Design and validation of prototype platforms for the creation of innovative distributed SW Router architectures (Forwarding and Control Element Separation - ForCES - Protocol Specification).
6. Study and implementation of mechanisms for the separation and allocation of data elements and control planes elements on Linux Software Routers (ForCES, RFC 5810).
7. Analysis of power management architectures and technologies on SW Routers (ACPI power states, linux drivers, governors).

8. Analysis of open source tools, such as Xorp and Quagga, for the implementation of distributed management/routing functions, with particular focus on OSPF and BGP protocols.
 9. Design and development of firmware for network devices in a Linux/VxWorks environment (STP protocol for Selex Comms S.p.a., patching of Intel NICs drivers to speed up packet forwarding).
4. Real-time large-scale mosaicing
1. Analysis of existing algorithms for mosaicing and stitching of digital images (both using the OpenCV pipeline or custom ones), to choose the open-source implementation with best initial performance.
 2. Parallelization (with OpenMP) of "easily" parallelizable tasks (e.g. features extraction and warping of images).
 3. Parallelization of other CPU-intensive tasks (e.g. OpenCV seamfinding and compositing). Extensive search in scientific literature of a "ready to use", parallel and fast seamfinding library to add to OpenCV for convenience. Found GraphCuts in nVidia's NPP toolbox, still too slow on average GPUs. Parallelized the simplest version of the OpenCV seamfinders.
 4. Added runtime and just-in-time compression/decompression of images (with format selectable among jpg, png, tif, webp) to save RAM and make larger mosaics possible even on mid-range PCs.

TECHNICAL SKILLS

1. Networking

1. TCP/IP protocol stack, Layer-3 protocols (especially BGP and OSPF), Layer-2 protocols (Ethernet, VLANs - 802.1q, Spanning Tree Protocol - 802.1d), Layer-2 Multicasting - 802.1p, Layer-3 Multicast Routing, network security (encryption protocols, tunneling), LAN/MAN/WAN planning and implementation, firewall configuration and management, network monitoring, quality of service.

2. Operating Systems (OSes)

1. Complete knowledge of Linux in all of its main flavors, and in particular of the "Debian-based" distributions (Ubuntu, Debian, etc.), Gentoo Linux, CentOS, as well as specifically "tailored" distributions such as DSL (Damn Small Linux) or Kali Linux for security.
2. Complete mastery of almost all Linux OS components, able to build Linux from scratch or "the other way around", to uninstall packages (and thus services) from a standard distribution to satisfy tight space/performance requirements.
3. Good knowledge of the Linux kernel and of how to patch it. Experience in patching Intel NICs drivers (with the SKB recycling patch) or the whole OS with Ingo Molnár's RT-PREEMPT patch, to achieve soft-realtime performance with the Linux kernel.

4. Good knowledge of system scripts (initrd scripts, DistUpgrade scripts, etc.). Ability to tailor the boot process of the distribution (e.g. to use a custom squashfs root filesystem) or the upgrade process of the distribution (e.g. to skip disk space checks, etc.). Ability to "cross-grade" distributions (e.g. from i386 to amd64 architectures).
5. Excellent experience in creating customized live Linux distributions for real-time production systems (e.g. tamper-proof or perishable due to improper use by the user).
6. Excellent knowledge as network and system administrator, including aspects concerning the management of server-side services and applications and devices such as routers, switches, firewalls and access points.
7. Good knowledge of Docker and other more standard virtualization environments such as Qemu or Virtualbox.
8. Good knowledge of the different versions of Microsoft Windows.

3. Programming Languages & Tools

1. Excellent programming skills both in "standard programming languages" as C++, C, Python, as well as in scripting languages such as Linux BASH scripting, QML (Qt Modeling Language) and AWK.
2. Excellent knowledge of GNU sed Regular Expressions.
3. Basic skills in HTML5, CSS, Javascript, PHP, Perl or LUA. Competent in Jekyll (static) websites building.
4. Excellent knowledge about compilation, deployment and debugging of software on Linux and Android systems.
5. Excellent skills for multi-platform application development (Linux, Windows, Android) using Qt libraries (for graphics) and STL + Boost (for the management of logic, data, and serialization/deserialization of network packets). In particular, excellent development skills with QtQuick 2.0 framework that exploits HW acceleration of modern video cards via OpenGL 2.0/OpenGL ES.
6. Good skills in using versioning software (mainly Git).

4. Software Frameworks

1. Good knowledge of both Keras and Fast.ai frameworks.
2. Good knowledge of Pandas, numpy, matplotlib and other essential python libraries.
3. Excellent knowledge of STL (C++ Standard Template Library) and Boost libraries.
4. Good knowledge of Qt 5.1 (2013) framework (both QtQuick1 and 2 flavors).
5. Excellent knowledge of the ROS (Robot Operating System) framework to enforce and incentive development of standardized software and datatypes across robots/projects/research groups.

5. Hardware

1. Solid skills in installing Linux distributions and development of software on the most diverse platforms (embedded, industrial,

mobile, IoT) and the most diverse media (disks, flash memories, USB sticks, ramdrive, SquashFS archives, EEPROM partitions, etc.).

2. Experience in programming PICs in C language.
3. Configuration and management experience for a wide range of network devices.
4. Knowledge of professional networking equipment (mainly Agilent router testers) for benchmarking network devices, such as routers, switches, servers, etc.
5. Experience of reflashing of IoT devices for use in standard network scenarios (e.g. MQTT connection via a master Raspberry Pi).

PUBLICATIONS

Energy-aware performance optimization for next-generation green network equipment

Bolla, Raffaele and Bruschi, Roberto and Davoli, Franco and Ranieri, Andrea

Proceedings of the 2nd ACM SIGCOMM workshop on Programmable routers for extensible services of tomorrow, pp. 49–54, ACM, 2009.

Green support for PC-based software router: Performance evaluation and modeling

Bolla, Raffaele and Bruschi, Roberto and Ranieri, Andrea

2009 IEEE International Conference on Communications, pp. 1–6, IEEE, 2009.

Drop: An open-source project towards distributed sw router architectures

Bolla, Raffaele and Bruschi, Roberto and Lamanna, Guerino and Ranieri, Andrea

GLOBECOM 2009 IEEE Global Telecommunications Conference, pp. 1–6, IEEE, 2009.

Performance and power consumption modeling for green COTS software router

Bolla, Raffaele and Bruschi, Roberto and Ranieri, Andrea

2009 First International Communication Systems and Networks and Workshops, pp. 1–8, IEEE, 2009.

Performance constrained power consumption optimization in distributed network equipment

Bolla, Raffaele and Bruschi, Roberto and Davoli, Franco and Ranieri, Andrea

Green Communications Workshop, Dresden, Germany, 2009.

Energy-aware equipment for next-generation networks

Bolla, Raffaele and Bruschi, Roberto and Ranieri, Andrea

Proceedings of the 4th International Conference on Future Internet Technologies, pages 8–11. ACM, 2009.

Beyond single-box SW router architectures

Bolla, Raffaele and Bruschi, Roberto and Lamanna, Guerino and Ranieri, Andrea

2009 International Conference on High Performance Switching and Routing, pp. 1–6, IEEE, 2009.

Performance evaluation of a DHT-based integrated mobility

architecture

Bolla, Raffaele and Ranieri, Andrea and Repetto, Matteo

Proceedings of the 2010 International Symposium on Performance Evaluation of Computer and Telecommunication Systems (SPECTS'10), pp. 14–21, IEEE, 2010.

A Simulative Framework to Estimate P2P Performance Indexes and Traffic Matrixes

Bolla, Raffaele and Bruschi, Roberto and Davoli, Franco and Ranieri, Andrea and Rapuzzi, Riccardo and Sciuto, Michele

Proceedings of the 2nd European Modeling and Simulation Symposium (EMSS06), Barcelona, Spain, 2006.

Exploiting DHT functionalities for pervasive network mobility

Bolla, Raffaele and Ranieri, Andrea and Repetto, Matteo

IEEE 5th International Symposium on Wireless Pervasive Computing (ISWPC 2010), pp. 349–354, IEEE, 2010.

Analyzing and Optimizing the Linux Networking Stack

Bolla, Raffaele and Bruschi, Roberto and Ranieri, Andrea and Traverso, Gioele

Grid Enabled Remote Instrumentation, pages 187–199. Springer, New York, NY, 2009.

Moving towards user-centric paradigms for internet mobility

Bolla, Raffaele and Ranieri, Andrea and Rapuzzi, Riccardo and Repetto, Matteo

International InterMedia Summer School (June 2009), Chania, Crete, Greece, 2009.

Testing the waters: design of replicable experiments for performance assessment of marine robotic platforms

Sorbara, Andrea and Ranieri, Andrea and Saggini, Eleonora and Zereik, Enrica and Bibuli, Marco and Bruzzone, Gabriele and Riccomagno, Eva and Caccia, Massimo

IEEE Robotics & Automation Magazine, vol. 22, no. 3, pp. 62–71, 2015.

Evaluation and comparison of navigation guidance and control systems for 2d surface path-following

Saggini, Eleonora and Zereik, Enrica and Bibuli, Marco and Ranieri, Andrea and Bruzzone, Gabriele and Caccia, Massimo and Riccomagno, Eva

Annual Reviews in Control, vol. 40, pp. 182–190, 2015.

Gesture-based language for diver-robot underwater interaction

Chiarella, D and Bibuli, M and Bruzzone, G and Caccia, M and Ranieri, A and Zereik, E and Marconi, L and Cutugno, P

Oceans 2015-Genova, pp. 1–9, IEEE, 2015.

Cooperative adaptive guidance and control paradigm for marine robots in an emergency ship towing scenario

Bruzzone, Ga and Bibuli, M and Zereik, E and Ranieri, A and Caccia, M

International Journal of Adaptive Control and Signal Processing, vol. 31, no. 4, pp. 562–580, 2017.

DeepRuler: Design, execute and evaluate path-following for robotic unmanned vehicles and experiment repeatability

Sorbara, Andrea and Ranieri, Andrea and Zereik, Enrica and Bibuli, Marco and Bruzzone, Gabriele and Caccia, Massimo

OCEANS 2015, Genova, pages 1–7. IEEE, 2015.

Multi-vehicle cooperative path-following guidance system for diver operation support

Bibuli, Marco and Bruzzone, Gabriele and Caccia, Massimo and Ranieri, Andrea

and Zereik, Enrica

IFAC-PapersOnLine, vol. 48, no. 16, pp. 75–80, 2015.

Underwater intervention robotics: An outline of the italian national project MARIS

Casalino, Giuseppe and Caccia, Massimo and Caselli, Stefano and Melchiorri, Claudio and Antonelli, Gianluca and Caiti, Andrea and Indiveri, Giovanni and Cannata, Giorgio and Simetti, Enrico and Torelli, Sandro and others

Marine Technology Society Journal, vol. 50, no. 4, pp. 98–107, 2016.

Machine learning methods for acoustic-based automatic Posidonia meadows detection by means of unmanned marine vehicles

Ferretti, Roberta and Bibuli, Marco and Caccia, Massimo and Chiarella, Davide and Odetti, Angelo and Ranieri, Andrea and Zereik, Enrica and Bruzzone, Gabriele

OCEANS 2017, Aberdeen, pp. 1–6, IEEE, 2017.

Towards Posidonia Meadows Detection, Mapping and Automatic recognition using Unmanned Marine Vehicles

Ferretti, Roberta and Bibuli, Marco and Caccia, Massimo and Chiarella, Davide and Odetti, Angelo and Ranieri, Andrea and Zereik, Enrica and Bruzzone, Gabriele

IFAC-PapersOnLine, vol. 50, no. 1, pp. 12386–12391, 2017.

CADDY Underwater Stereo-Vision Dataset for Human--Robot Interaction (HRI) in the Context of Diver Activities

Gomez Chavez, Arturo and Ranieri, Andrea and Chiarella, Davide and Zereik, Enrica and Babi{\c}, Anja and Birk, Andreas

Journal of Marine Science and Engineering, vol. 7, no. 1, p. 16, 2019.

Exploitation of an Unmanned Aerial Vehicle to characterize the air-sea interface near glacier fronts in the Arctic region

Ferretti, Roberta and Caccia, Massimo and Odetti, Angelo and Ranieri, Andrea and Carotenuto, Federico and Zaldei, Alessandro and Bruzzone, Gabriele

EGU General Assembly Conference Abstracts, vol. 20, p. 6753, 2018.

A Novel Gesture-Based Language for Underwater Human-Robot Interaction

Chiarella, Davide and Bibuli, Marco and Bruzzone, Gabriele and Caccia, Massimo and Ranieri, Andrea and Zereik, Enrica and Marconi, Lucia and Cutugno, Paola

Journal of Marine Science and Engineering, vol. 6, no. 3, p. 91, 2018.



SKILLS & PROFICIENCY

Linux



C++



Python



QML



HTML5, CSS, Javascript



Bash



Regex



Jekyll



Latex



I hereby authorize the use of my personal data in accordance to the GDPR 679/16 - "European regulation on the protection of personal data"

This CV is available online at [this link](http://tiny.cc/2vixaz): <http://tiny.cc/2vixaz>