Alessio Xompero

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PROFILE

- Research assistant working in an international and collaborative project (CORSMAL) highly orientated on the complementarity and fusion of different sensing modalities (vision, audio tactile) using machine learning, deep learning, multi-view and 3D geometry, applied for robotic applications
- Computer vision/image processing specialization that led to contributions on the design and implementation of vision algorithms, eventually complementing/fused with other modalities
- Developed skills for carrying out independent and collaborative research, including data collection and analysis, critical analysis, problem modelling and solving, and effective data visualisation
- Developed and mastered programming skills (C/C++, MATLAB), but flexible to use other languages (Python, Bash scripting); knowledge and use of several (vision) libraries/softwares (OpenCV, OpenMVG, COLMAP); daily use of software versioning tools (Git) and collaborative writing tools (LaTeX, Overleaf)

RESEARCH EXPERIENCE

Research Assistant, Queen Mary University of London **Oct 2019 – Mar 2020**

- Working in an international, collaborative project (CORSMAL) for the fusion of multiple sensing modalities (audio, vision, tactile) to estimate the physical properties of objects manipulated by a human and handed over to a robot
- Contributions: design and development of an algorithm for estimating the shape of objects from two cameras [C1]; collection of a large multi-modal dataset (CORSMAL Containers Manipulation); writing up of two papers, one accepted in an international journal [J2] and one accepted to an international conference [C1]; writing up of two challenge proposals (accepted) to promote the project and the dataset

Intern, Perception Team, INRIA Grenoble Rhone-Alpes, France **Mar – Aug 2014**

- Contribution: modelling and implementation (MATLAB) of an algorithm for multiple object tracking using a probabilistic graphical model and the expectation-maximization algorithm (machine learning)
- Outcomes: master thesis; publication in an international journal [J3] (*work extended and mainly written by colleagues*)

EDUCATION

Ph.D. in Electronic Engineering, Queen Mary University of London **2020**

- Thesis: *Local features for view matching across independently moving cameras* (PhD VIVA passed with minor corrections)
- Project part of an international collaboration with about 50% in London and 50% in Fondazione Bruno Kessler (Trento, Italy) that helped to improve effective communication skills through reporting (*LaTeX*), regular meetings, and presentations
- Contributions: design and development (*C/C++, MATLAB*) of compact local image features that exploit temporal and scale information to be matched between cameras that independently move in an unknown environment [J1]; proposed a framework for cross-camera visual place recognition using an adaptive tree of stable local spatio-temporal features; collected and annotated a dataset of scenarios with multiple hand-held cameras moving in unknown environments; collaborated in the design and implementation (*C/C++, MATLAB*) of audio-visual algorithms for tracking a speaker and annotating multi-modal streams in 3D [C2],[C3]

Master's degree in Telecommunications Engineering, University of Trento, Italy **2015**

- Thesis: *ViProT: A visual probabilistic model for moving interest point clusters tracking*
- Multimedia specialisation (Computer Vision, Data Hiding, Multimedia Networking)
- Optional coursework projects: development of an existing unsupervised clustering approach for sub-event detection in large image galleries (*MATLAB*); development of an existing approach for image splice detection

(machine learning, image processing, *MATLAB*); development of a Facebook application (*PHP, HTML5, Javascript, CSS3*) with orientation at project planning (team of 2 people)

- Intel Business Challenge Europe 2013 (team of 3 people): business plan and elevator pitch preparation

SELECTED PUBLICATIONS

[J1] A spatio-temporal multi-scale binary descriptor **2020**

- Design and development of compact local image features that exploit temporal and scale information to be matched between cameras that independently move in an unknown environment
- IEEE Transactions on Image Processing

[J2] Benchmark for Human-to-Robot Handovers of Unseen Containers with Unknown Filling **2020**

- Benchmark for easily reproducing worldwide and evaluating the dynamic human-to-robot handover task
- IEEE Robotics and Automation Letters

[C1] Multi-view shape estimation of transparent containers **2020**

- Design of an algorithm to estimate from two images the 3D shape and dimensions of container-like objects
- IEEE International Conference on Acoustics, Speech and Signal Processing

[C2] Accurate target annotation in 3D from multimodal streams **2019**

- Multi-modal approach that uses annotations from reference streams (e.g. individual camera views) and measurements from unannotated additional streams (e.g. audio) to infer 3D trajectories via optimization
- IEEE International Conference on Acoustics, Speech and Signal Processing

[C3] 3D Mouth Tracking from a Compact Microphone Array Co-located with a Camera **2018**

- Design and development of an audio-visual algorithm for tracking a moving speaker (partial contribution)
- IEEE International Conference on Acoustics, Speech and Signal Processing

[J3] An On-line Variational Bayesian Model for Multi-Person Tracking from Cluttered Scenes **2016**

- Probabilistic graphical model for tracking a time-varying number of persons from cluttered visual observations
- Computer Vision and Image Understanding

FURTHER EXPERIENCES

Student lab demonstrator (former Teacher Assistant), Queen Mary University of London **2018-2020**

- Introduction to Computer Vision module for under- and post-graduate students
- Assistance to the students and assessment of the coursework (report + software in MATLAB)

Collaborator, MMLab, University of Trento, Italy **Apr – Sep 2015**

- Developed the notification service of a medical-to-patient application (project LifeGate in collaboration with an external company); main challenge: quickly learn, adapt and interface with ASP.NET and Android programming
- Collected and annotated 2 large datasets for Synchronization of Multi-User Event Media at Multieval Benchmark

Reviewer (Volunteering)

- *Journals*: IEEE Transactions on Multimedia; IET Computer Vision; AI Perspectives
- *Conferences:* IEEE International Conference on Acoustics, Speech and Signal Processing; IEEE International Conference on Image Processing