Christopher Edwin Mower

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EDUCATION

University of Edinburgh — **Edinburgh, UK**
PhD Informatics [iCASE Studentship funded by The Costain Group] — *September 2021*
Thesis: An Optimization-based Formalism for Shared Autonomy in Dynamic Environments
Supervised by Professor Sethu Vijayakumar FRSE.

Imperial College London — **London, UK**
MSc Computing (Visual Information Processing) — *August 2016*
Dissertation: Objective Assessment of Surgical Dexterity
Supervised by Dr Benny Lo.

University of Manchester — **Manchester, UK**
MSc Applied Mathematics with Numerical Analysis [dissertation funded by NAG] — *August 2015*
Dissertation: Shrinking For Restoring Definiteness
Supervised by Professor Nicholas J. Higham FRS, and Dr Craig Lucas (NAG).

University of Sheffield — **Sheffield, UK**
BSc Mathematics — *August 2012*

PUBLICATIONS

Christopher E. Mower, João Moura, Sethu Vijayakumar, "*Skill-based Shared Control*", Robotics: Science and Systems (R:SS), 2021. [Links: paper, video, presentation, poster]

Christopher E. Mower, João Moura, Sethu Vijayakumar, "*Modulating Human Input for Shared Autonomy in Dynamic Environments*", IEEE RO-MAN, 2019. [Links: paper, pdf]

Christopher E. Mower, Wolfgang Merkt, Sethu Vijayakumar, "*Comparing Alternate Modes of Teleoperation for Constrained Tasks*", IEEE CASE, 2019. [Links: paper, pdf, preprint, video]

Wolfgang Merkt, Yiming Yang, Theodoros Stouraitis, **Christopher E. Mower**, Maurice Fallon, Sethu Vijayakumar, "*Robust shared autonomy for mobile manipulation with continuous scene monitoring*", IEEE CASE, 2017. [Links: paper, pdf, video, outreach demo, press (BBC), press (Made In Leeds TV)] [**First prize for "Greatest Potential For Positive Impact", Robots for Resilient Infrastructure Challenge, 2017**]

EXPERIENCE

University of Edinburgh — **Edinburgh UK**
Research Associate — *September 2021 — Present*
- Collaborating on the European Union Horizon 2020 project HARMONY.
- Affiliated with The Alan Turing Turing Institute.

University of Edinburgh — **Edinburgh UK**
Lab demonstrator — *January 2019 — June 2020*
- Provided expertise in a supervisory role, for the course System Design Project (SDP), on human-robot interaction, usability testing, and interfaces. Marking assignments responsibilities, group assessments, etc.

The Numerical Algorithms Group (NAG) — **Manchester, UK**
Numerical software developer intern — *June 2014 — October 2014*
- Analyzed and implemented the routine `G02ANF` in FORTRAN that computes a correlation matrix, subject to preserving a leading principle submatrix by applying the smallest uniform perturbation of the remainder of the approximate input matrix.
- Authored documentation and example routines for `G02ANF`, and collaborated with NAG personnel on the development of several unit and functional tests.
- Routine included in the Mark 25 NAG C and FORTRAN Libraries, and NAG Toolbox *for MATLAB*.
- Acknowledged as a code contributor to the NAG Library.

University of Manchester — **Manchester, UK**
Research intern — *May 2014 — October 2014*
- Implemented a method in Python that computes a unit triangular matrix with prescribed singular values, unit/functional tests, and reviewed related code developed by PhD students at University of Manchester. Used Git/Github for source control.
- Project supervised by Professor Nicholas J. Higham, FRS.

Ryanair — **Stansted Airport, UK**
Engineer intern — *May 2013 — June 2013*
- Assisted maintenance checks and repairs on Boeing 737-800 aircraft.

SKILLS

- **Programming**: Most fluent in Python, then MATLAB, FORTRAN, and C++. Some experience with Lisp, and Lua.
- **Hardware**: Experience developing/implementing demonstrations and experiments using the KUKA LWR Arm, Kawada Nextage humanoid, Clearpath Husky UGV, Universal Robot 5 (UR5) Arm, and Robotiq 3-finger adaptive gripper. Additionally, experience setting up and integrating several sub-systems: human interfaces (i.e. joystick, space mouse), sensors (i.e. ASUS Xtion RGBD-camera, and Bumblebee2 FireWire stereo vision camera), and motion tracking (i.e. Vicon).
- **Operating systems**: Most experienced using Ubuntu and Mac OS. Some experience using Windows.
- **Libraries, packages, and frameworks**: CasADi, Eigen, Git, Gurobi, IPOPT, KNITRO, LAPACK, LCM, Matplotlib, NAG Library, Numpy, OpenAI Gym, OpenCV, Pandas, PyBullet, PyGame, ROS/ROS2, SNOPT, Scikit-learn, Scipy, and V-REP.
- **Document preparation and code editing**: LaTeX, Emacs, and Vim. Some experience using Visual Studio Code.
- **Time management**: Org-mode (for Emacs).
- **Soft skills**: mentoring, public speaking, self-motivated, and open to feedback and idea exchange.

PROJECTS

- **ROS-PyBullet Interface** (*currently private, release planned in next several months*): PyBullet, a full physics simulator, is interfaced with ROS, a pseudo operating system designed for robotics. The package can be easily used alongside real robots where the user need only remap ROS topics.
  - Written in Python within a ROS package.
  - I am the lead developer alongside other core contributors from the SLMC Group, University of Edinburgh. In addition, I regularly submit pull-requests and review others code.
- **EXOTica**: an extensible tool-set for inverse kinematics, trajectory optimization, and optimal control with a design advocating modularity, extensibility, and integration with ROS.
  - Written in C++ with bindings for Python.
  - Summary of my contributions: several task maps (maps joint states to some task space), modifications/additions/bug-fixes to EXOTica core functionality, and Python bindings; a facility that allows a user to interactively tune a cost function; unit/functional tests for each contribution; code reviews on others pull-requests.
  - Source control for EXOTica is done using Git/Github and leverages continuous integration.

RESPONSIBILITIES

- Reviewer: ICRA, CASE.
- Vice President for SIAM Student Chapter, University of Manchester, Sept 2014 — Sept 2015.
- Session chair, SIAM Student Chapter Conference, 2014, 2015.
- Program Representative for MSc Group, University of Manchester, Sept 2014 — Sept 2015.
- School of Mathematics Board Member, University of Manchester, Sept 2014 — Sept 2015.
- Team Captain for University of Sheffield Badminton Club, University of Sheffield, Sept 2010 — Sept 2012.

ADDITIONAL

- Professional qualifications: First aid at work (St. Johns Ambulance, UK), National Pool Lifeguard Qualification (Royal Life Saving Society, UK).
- Personal interests: Badminton (competed at county and university level, coaching experience), Guitar.

REFERENCES

Available upon request.