Matthew Budd

Final-Year Engineering Undergraduate at the University of Oxford

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Research Interests

I am particularly interested in applying novel learning and reasoning algorithms to complex navigation and planning tasks in uncertain environments, with application to mobile robotics. Academic and industry references are available on request.

Education

MEng in Engineering Science 2016 – June 2020
Pembroke College, University of Oxford *Oxford*

- 3rd year examinations: First (average 80%). Placed 8th in a cohort of ~180 students.
- Recipient of the Paul Martins - BP Scholarship in Engineering (Pembroke College specific).
- Awarded an IET Diamond Jubilee Scholarship for the length of the degree (`www.theiet.org/diamond`).
- Awarded the 2017 Gibbs Prize in Engineering Science Preliminary Examinations - Practical.

A-Levels and GCSEs 2010 – 2015
Westminster School *London*

- A-Level: 5 A*s in Maths, Further Maths, Physics, Chemistry and Electronics.
- GCSE: 10 A*s, A in Further Mathematics GCSE (highest grade) and A in English Literature.
- Awarded an Arkwright engineering scholarship (`www.arkwright.org.uk`) for both years of A-levels.

Research Projects

4th Year Research Project October 2019 – May 2020
"Safe Planning for Markov Decision Processes with Unknown State Features"

- 4th-year research project supervised by Professor Nick Hawes in the Oxford Robotics Institute. The project investigates and develops robotic navigation strategies for hazardous environments where the agent must make predictions about uncertain aspects of its surroundings.
- In-depth literature review followed by theoretical work and implementing robot behaviour in simulation.

3rd Year Group Design Project October 2018 – May 2019
"A New Beam-Profile Monitor for the Large Hadron Collider at CERN"

- Research and design development for a cutting-edge proton beam imaging instrument to be installed in the Large Hadron Collider after the upcoming High-Luminosity upgrade.
- Carried out optical and gas flow modelling with a GPU-accelerated simulation regime to optimise the design of both a hypersonic gas jet apparatus and a gas jet characterisation instrument.
- Travelled to CERN in Geneva to give a technical presentation to the Beam Instrumentation Group and submitted a report outlining the group's research conclusions and design proposals.

Key Skills

- Highly confident with C, Python and several Python frameworks (e.g. Django), C++, ROS, MATLAB, Simulink, Linux (OS and associated tools, developing Embedded Linux components), cross-compilation toolchains for embedded software on ARM Cortex M and A processors, FreeRTOS, electronic and mechanical prototyping, electronics lab equipment skills, IPv4 and IPv6 networking architectures.
- Working knowledge of Xilinx FPGA tools, containerised (Docker) and GPU-accelerated (CUDA) programming, Javascript, HTML/CSS, SQL database management, 3D printing and UX / graphic design.
- Other tools: SOLIDWORKS mechanical CAD, KiCAD and Eagle electronic CAD, Wireshark and other network analysis tools, LaTeX, version control with Git (and related online hosts) and Subversion, industrial computer vision systems, issue tracking and technical documentation.

Experience

Technology Scholar at Cambridge Consultants Ltd. July – September 2019
Summer internship placement in a software and electronics group *Cambridge*

- **Software engineer** on an inhaler test rig project.
  - Embedded software development and testing. Embedded C++ with a FreeRTOS-based framework.
  - Front-end user interface development and testing. JavaScript and Python with a Tornado webserver.
  - Responsible for modelling elastic light scattering from microscopic vapour particles. Designed and ran a CELES (`github.com/disordered-photonics/celes`) simulation regime on consumer GPUs with CUDA.

RoboCup 2019 competitor Team ORIon July 2019
Week-long international robotics competition, `ori.ox.ac.uk/ori-at-robocup-2019/` *Sydney, Australia*

- **Competitor in the @Home league**, with our team's code running on a Toyota HSR robotics platform.
  - Researched and implemented robotic manipulation behaviours - an integral part of the competition.
  - Troubleshooted robot network communications reliability, and succeeded in fixing two critical issues.
  - Presented the team's original research at the poster competition, alongside another teammate.

Control Engineering Intern at Archangel Lightworks June – August 2018
Summer internship placement in a satellite optical communications start-up *Harwell, Oxfordshire*

- **Development of a Pointing, Acquisition and Tracking (PAT) Prototype** for Free-Space Optical Comms.
  - Carried out literature review and requirements identification/justification for PAT Prototype system.
  - Researched and implemented PAT methodologies and high-speed control systems.
  - Specified project plan, defined interfaces and carried out integration work across multiple hardware and software components including the high-speed FPGA-based controller, actuators, and imaging devices.

Micro-Intern at Ensoft Ltd. December 2017
Week-long micro-internship, working on adding functionality to the Ensoft intranet *Harpenden*

- **Python web-app development with Django**, for the front- and back-end of the site.
  - Added new functionality to the back-end so that desk allocation changes automatically caused the phone and mailing lists setup to be updated for the employee moving desk.
  - Implemented automatic generation of large IP phone configuration files in response to desk moves.

Technology Scholar at Cambridge Consultants Ltd. June – August 2017
Summer internship placement in a software and electronics group *Cambridge*

- **Embedded Communications Engineer** and Linux Kernel Software Developer.
  - Designed and implemented Linux kernel-space software in C including kernel modules and adding functionality to the kernel network stack. Also wrote user-space software in C and Python.
  - Specified and cross-compiled custom Embedded Linux distributions using OpenEmbedded and Yocto.
  - Carried out network architecture research and design for IPv6 communications on IoT devices.

Technology Scholar at Cambridge Consultants Ltd. September 2015 – July 2016
Gap-year placement in a software and electronics group *Cambridge*

- **Electronics and Low-Level Software Lead** on an internal cross-disciplinary robotics project.
  - Successfully delivered a prototype robot arm system to be demonstrated in a company-wide meeting, despite significant time/budget constraints, and presented my areas of responsibility in the project.
  - Took a lead role in the engineering design process, starting with requirements specification and concept generation through to systems integration.
  - Software and control system implementation with C and MATLAB/Simulink. Integration work across multiple components, working across disciplines with other engineers on the project.
  - `blog.cambridgeconsultants.com/robots-from-golden-fairy-to-iron-serf/`
- **Embedded Communications Engineer** on a low-power embedded networking project.
  - Software design and implementation in C (for Cortex-M based microcontroller systems) including API design and implementation, and Python (testing, analysis and debugging).
  - Experience working with build systems and development tools in Linux environments.
  - High level of competency with source control (Git and Subversion), issue tracking (Jira), technical documentation and collaboration, and task time estimation.