MAX GAMILL CV

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PERSONAL STATEMENT

My Master's degree in Physics and computational biophysics PhD has focused on new computational methods to further understand how physical properties of matter inform functional biological outcomes. For this, I've developed multiple open-source software packages which follow software engineering principles such as factory methods, FAIR (findable, accessible, interoperable, and reusable), and testing. These software won the 2023 Sheffield FAIR software award and total over 26,000 downloads by the international research community. In my future career I aim to advance my deep learning skills beyond academia and apply myself to solving business orientated data science problems, and streamlining these new technologies into processing pipelines.

WORK EXPERIENCE

PHD: COMPUTATIONAL BIOPHYSICS & IMAGE ANALYSIS   SEPTEMBER 2021 – PRESENT

UNIVERSITY OF SHEFFIELD

- Developed the AFM image analysis software TopoStats to quantify nanoscale biomolecules in atomic force microscopy images. This has over 9,000 downloads from international research groups.
  - Won the Sheffield FAIR software development award 2023.
  - Developed features to trace and order the path of complex crossing, and branching structures, calculating 24 additional characterisation metrics.
  - Refactored the original Python 2 dependent software into a PyPi with unit, integration, and system tests, simple, advanced and function-level documentation.
  - Collaboration with external contributors and users to provide advice and maintain the software.
  - Enabled collaborations with esteemed international research institutions such as EMBL, I2BC, The Globe Institute, The Francis Crick Institute, and CSIC.
- Developed the atomic force microscopy software AFMReader to load many atomic force microscopy image files and extract data and metadata into Python. This has over 17,000 downloads from international research groups.
  - Involved interrogating the structure of propriety filetypes to identify how image data and metadata is stored and can be extracted.
  - Collaboration with developers of single filetype loading packages to help maintain and integrate into our software.
- Applied and developed machine learning and deep learning pipelines for clustering, computer-vision segmentation improvements and classification of biomolecules.
  - Implemented Mask R-CNN to classify DNA shapes to understand how DNA shape affects its function.
  - Developed variational auto-encoder models to cluster and compare DNA shapes in the latent space, and to identify similar structures from a template image.
  - Integrated U-Net architectures to improve the segmentation accuracy of long flexible DNA molecules to better trace
  - Utilised the DVC package to track deep learning experiments and implement data version control.
  - Implemented training on remote architectures such as a high performance computing cluster (Stanage), and a local server.
- Authored 1,300+ commits and 96 PR's working collaboratively on Git alongside junior software engineers, other PhD students, and research software engineers.
  - Applied code linting, spell checking, a libraries
- Lead "TopoStats Tinkering" meetings bridging the knowledge gap between the experimental and software teams to feedback and guide features.
- Created and lead "Code Clean" meetings to assign and prioritise the accumulating simple GitHub issues.
- Familiar with data science libraries such as Pandas, Scikit Image, and Scikit Learn, to compile and merge image features, apply image processing methods, and identify and cluster the most important geometric features across a dataset.

- Managed a Masters student and project utilising deep learning to classify DNA shapes.
- Managed, taught, and planned achievable software development tasks, for a work experience student such as their first pull request in an open-source repository.
- Collaborated between 4 national and international laboratories for research yielding a scientific publication in Nature Communications on a novel image analysis pipeline to measure complex DNA conformations.
- Hosted a workshop containing background explanations and a live demo on the open-source TopoStats software at the Milan Images 2 Knowledge conference.
- Invited speaker at a BIRS DNA topology conference in Canada on a novel image analysis pipeline to analyse and quantify complex knotted and catenated DNA structures.

IBM (INTERNATIONAL BUSINESS MACHINES)   JULY 2018 – JULY 2019

INTERNSHIP – COGNOS ANALYTICS TECHNICAL SUPPORT ANALYST

- Resolving 230+ cases spanning general questions, error messages, defects, and load balancing issues.
- Managing 10 to 20 clients/cases at once and prioritising system critical and old cases.
- Developing work-arounds tailored to client requirements and software limitations.
- Configuring environments to build minimal test cases on Unix and Microsoft operating systems.
- Root cause analysis through the investigation of log files.
- Building Cognos Analytics reports and database queries.
- Authored 36 technical documents and made 11 corrections to existing documents.
- Net promoter score (NPS) of 79 (team highest).

EDUCATION

MPHYS: PHYSICS (1ST IN YEARS 1, 2, 3, AND MASTERS)   SEPTEMBER 2016 – JULY 2021

UNIVERSITY OF LEEDS

- Master's project – found a single molecule localisation microscopy deep learning model was more robust to object density and image noise when comparing the accuracy of 3D point predictions against a mathematical model. This was used to identify the density of specific receptors across a killer T Cell

Other relevant modules and marks include:

- Molecular Simulation (88) – Utilised high-performance computing clusters to carryout molecular dynamics simulations of the motion of proteins and quantify behaviour under different simulated conditions.
- Group Industrial Project (80) – Worked alongside RBSL to model and train bipedal and quadrupedal robots to walk using MATLAB and various reinforcement learning methods.
- Computing 1 & 2 (91 & 90) – Implemented Physics-based models including a 1D spin-Ising model for calculating spin alignments at varied temperatures, simulated using Metropolis Monte-Carlo methods.
- Maths 1, 2, 3 & 4 (78, 79, 89 & 68) – Learnt theory and physical applications of scalars and vectors, multivariable calculus, matrices and operators, transforms and partial differential equations.

RELEVANT INTERESTS AND COMMITMENTS

- Machine Learning – Use machine learning segmentation / style transfer models alongside other image processing libraries to design personalised cards and wedding invitations. Currently developing into an interactive Django website.
- Completed courses – Using medical imaging deep-learning models, and contributing and developing microscopy deep-learning resources, experience with HPC resources from introductory skills courses.
- Teaching – beginners deep learning workshop in collaboration with the Research Software Engineering team pitched at academics to use in their own research.
- Web Development (Django) – Created from scratch, and hosted, a dynamic and interactive website portfolio of Python projects using the Django framework on a Raspberry Pi Server (currently offline).

REFERENCES

- Professor Alice Pyne - Current PhD supervisor - a.l.pyne@sheffield.ac.uk
- Dr Laura Wiggins – TopoStats software collaborator - l.wiggins@sheffield.ac.uk
- Will Branney – IBM Cognos Analytics technical support lead – will.branney@uk.ibm.com