



# RYAN STOCKS

COMPUTER SCIENTIST / TUTOR

## ABOUT

Fourth year undergraduate student undertaking the Bachelor of Philosophy at ANU with a passion for research and High-Performance Computing studying Computer Science, Physics and Mathematics.

## CONTACT

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### LOCATION:

Canberra, ACT, Australia

## LINKS

### ORCID:

<https://orcid.org/0000-0003-0654-9670>

### Git Hub:

[github.com/ryanstocks00](https://github.com/ryanstocks00)

### Google Scholar:

[scholar.google.com/citations?user=sm4Ea8oAAAAJ](https://scholar.google.com/citations?user=sm4Ea8oAAAAJ)

### Research Gate:

[www.researchgate.net/profile/Ryan-Stocks](https://www.researchgate.net/profile/Ryan-Stocks)

### LinkedIn:

[www.linkedin.com/in/ryan-s-020414115/](https://www.linkedin.com/in/ryan-s-020414115/)

## EDUCATION

### Australian National University – Bachelor of Philosophy (Science)

2019 - Present

Dean's Science Education Commendation Award – 2019 and 2020

Straight HD (GPA 7.0/7.0)

### Radford College – High School Years 7-12

2013 - 2018

College Dux with subject awards (highest mark) in Specialist Maths, Specialist Methods, Physics, IT (Programming) and Technical Theatre

### Various Summer Schools

2015 – 2018

Took part in the invitational informatics Olympiad training program and National Youth Science Forum (NYSF) throughout high school.

## WORK EXPERIENCE

### Penten – Software Engineer

November 2020 - Present

Working with the Applied AI group at Penten developing advanced cyber deception tools and software. This includes using natural language processing (NLP) techniques such as GPT-2 to generate fake documents (honey files) and deception agents.

### Australian National University – Tutor

2020 – Present

Tutored and demonstrated a variety of courses including

- COMP1100/1130 (Programming as problem solving)
- COMP1110/1140 (Structured Programming)
- COMP2300 (Computer organization and program execution)
- COMP3320 (High performance scientific computing)
- COMP3600 (Algorithms)
- COMP3620 (Artificial Intelligence)
- COMP4300 (Parallel Systems)

This included writing materials, running workshops, and marking student assignments/exams.

### Australian National University – Research Assistant/Casual Programmer

2018 – Present

Worked with the RE100 renewable energy research group as a programmer, creating site searching algorithms and visualization for pumped hydro energy storage globally. The resulting PHES sites from my global search can be viewed here:

<https://www.nationalmap.gov.au/#share=s-7e08wcKAY2H1jbLc6qXH7OTQJpG>

Also currently working with the ANU bushfire initiative to develop and simulate algorithms for a collection of drones and helicopters to be used to inspect recent lightning strikes for potential ignitions.

### ANU Cyber Institute – Casual Programmer

May 2020 – October 2020

Working with the ANU cyber institute on product and website development, in particular a novel Terms of Service payment scheme in which users can select to pay for a product with either money or their data.

## PUBLICATIONS

### Enabling large-scale correlated electronic structure calculations: scaling the RI-MP2 method on summit

Giuseppe MJ Barca et. al. 33rd International Conference for High Performance Computing, Networking, Storage and Analysis: Science and Beyond, SC 2021. Doi: [10.1145/3458817.3476222](https://doi.org/10.1145/3458817.3476222)

### Enhancing Classical Gold Nanoparticle Simulations with Electronic Corrections and Machine Learning

Stocks R, Barnard AS. J Phys Condens Matter. 2021 Jun 24. Doi: [10.1088/1361-648X/ac0751](https://doi.org/10.1088/1361-648X/ac0751).

### Global Atlas of Closed-Loop Pumped Hydro Energy Storage

Matthew Stocks, Ryan Stocks, Bin Lu, Cheng Cheng, and Andrew Blakers. Joule. PP. 270-280. [10.1016/j.joule.2020.11.015](https://doi.org/10.1016/j.joule.2020.11.015).

### Pathway to 100% Renewable Electricity

Andrew Blakers, Matt Stocks, Bin Lu, Cheng Cheng, and Ryan Stocks. IEEE Journal of Photovoltaics. PP. 1-6. [10.1109/JPHOTOV.2019.2938882](https://doi.org/10.1109/JPHOTOV.2019.2938882).

### A Global Atlas of 616,000 Pumped Hydro Energy Storage Sites

Blakers, A., Cheng, C., Lu, B., Nadolny, A., Stocks, M., Stocks, R. Joule. 2019 ISES Solar World Congress. [10.18086/swc.2019.20.02](https://doi.org/10.18086/swc.2019.20.02)

### Development of a Global Atlas of Off-River Pumped Hydro Energy Storage

Matthew Stocks, Ryan Stocks, Bin Lu, Cheng Cheng, and Andrew Blakers. Wind Integration Workshop, October 2019, Dublin, Ireland

### Hydroelectricity in Australia

Andrew Blakers, Matt Stocks, Bin Lu, Cheng Cheng and Ryan Stocks. Energy News - Australia Institute of Energy Volume 37 No 3 – Sept 2019 p11-13

## AWARDS

International Mathematical Modelling Competition – Outstanding award, Top of the world	2018
Australian Mathematics Competition – Best in State	2018
Australian Mathematics Competition - Medal	2017
UNSW ProgComp – 1 <sup>st</sup> Place	2018
ICPC Regional Finalist	2019
Tournament of Towns – High Distinction (Representing Canberra)	2014-2017
Australian Intermediate Mathematics Olympiad - Prize	2016
UNSW ProgComp – 3 <sup>rd</sup> Place	2017
Australian Informatics Olympiad – Gold and Perfect Score	2017
Tony Harris Award for Technical Theatre	2016, 2017
Australian Mathematics Competition - Prize	2013, 2015, 2016
Australian Mathematics Olympiad - Bronze	2018
Computational and Algorithmic Thinking Competition – Perfect Score	2017, 2018
Radford Academic Honour Roll	2015-2018

And numerous high distinctions across ICAS Science, ICAS Maths, Mathematics Challenge for Young Australians, APSMO, Big Science, Australian National Chemistry Quiz, ICAS English, Australian Geography Competition and Computational and Algorithmic Thinking Competition.

## PROJECTS

### A Multi-GPU, Low Space and Time-Complexity RI-MP2 algorithm and implementation

Semester 1 2021 – Supervised by Dr. Giuseppe Barca

This project aimed to develop a new RI-MP2 algorithm - one of the landmark methods in computational quantum mechanics - that will be able to exploit the massive parallelism of many-GPU hardware architectures and whose space and time complexity will be reduced from the conventional cubic and quintic scaling to quadratic and quartic, respectively. The strong and weak scaling performance of the new implementation will be benchmarked on the Summit supercomputer at the Oak Ridge National Lab. A paper has been accepted to the SC21 conference journal regarding some of this work.

### Enhancing Classical Simulations with Electronic Corrections and Artificial Neural Networks

Semester 2 2020 – Supervised by Prof. Amanda Barnard

Classical molecular dynamics (MD) simulations of materials and nanoparticles have the advantage of speed and scalability but lack the ability to describe electronic properties. Quantum mechanical and ab initio simulations have the advantage of providing accurate estimations of the electronic structure and charge transfer but are typically limited to small and simple systems. In this project identical sets of classical and electronic structure simulations were used to train an artificial neural network to predict an energy correction term for arbitrary gold nanoparticles. A prediction accuracy of 0.93 was achieved, demonstrating great potential for the application of machine learning to improve the accuracy of MD simulations.

## SKILLS

Proficient in numerous programming languages, in particular C, C++, and Python, with additional experience using ARM Assembly, Ada, Java, HTML, CSS, JavaScript, Haskell, Q# and Bash. Highly experienced in industrial software development with version control systems such as git including continuous integration and project management tools such as Jira and Confluence.

Experienced using high performance computing (HPC) and massively parallel systems such as the Gadi supercomputer at NCI using programming models including MPI and OpenMP. Also experienced programming utilizing multi-GPU hardware using low level libraries such as CUDA.

## REFEREES

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### **Dr. Giuseppe Barca**

Supervisor for research project developing a multi-GPU low space and time-complexity RI-MP2 algorithm and implementation and course convenor for COMP3320 in Semester 2 2021 whilst I was the lab tutor.

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### **Prof. Andrew Blakers**

Supervisor for pumped hydro research with the RE100 group at ANU.

Phone: 0417 390 139 or 6125 5905

Email: [andrew.blakers@anu.edu.au](mailto:andrew.blakers@anu.edu.au)

### **Dr. Uwe Zimmer**

Course convenor for COMP2300 in Semester 1 2021 whilst I was a tutor.

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