

ESTIMATING GEOFEATURES WITH AGENTS

Ph.D. research opportunity

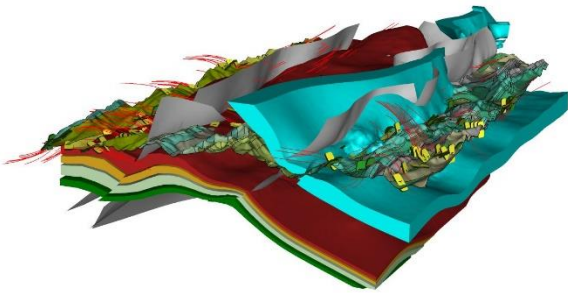
With the **Department of Natural Resources Canada - Geological Survey of Canada**
Lands and Minerals Sector, Ottawa, (National Capital) Region (Ontario).

In our Critical Minerals and Geoscience Data (CMGD) program

If your keen on helping to develop the next generation of 3D visualization technology for Earth systems with modern digital 2D and 3D geospatial technologies, then this project is for you!

Who do we want?

Someone with a curiosity for representing natural geoproceses, is computer and technology oriented, self motivated and likes 3D graphics, simulation and geospatial (GIS-3D modelling) technologies.



Project Description

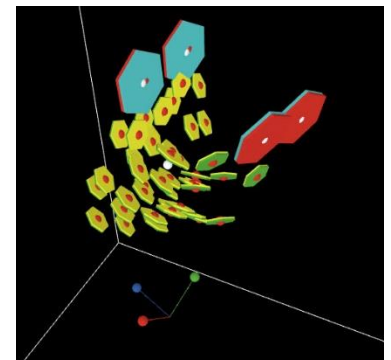
This Ph.D. project “Estimating Geofeatures with Agents” will focus on multi-agent Artificial Intelligence (AI) systems to reasonably reproduce simple common geological forms. These would initially include lithospheric scale tectonic features (faults, shear zones and deformation corridors). Extending current hybrid implicit-explicit methods in use, this work will provide a proof of concept and an initial proto-type that could be a base for more challenging geological and sparse data scenarios.

Investigations will focus on developing the ground work for geological knowledge embedding in the multi-agent framework, approaches to non-meshed surface cohesion and propagation algorithms, quaternion implementation for structural agent rotations, as well as 3D graphics rendering of simple structural surfaces such as harmonic and disharmonic fold trains of sedimentary horizons, simple fault networks and single intrusive boundaries. This research will be able to provide a solid conceptual and mathematical grounding for moving ahead with more practical implementation and testing. Agent systems would need to be looked at from a mathematical perspective to formalize relationships, rule-sets and geologically reasonable behaviors. New simulation based methods and research codes will be applied to estimating Canadian examples of tectonic features at depth (faults, shear zones, deformation corridors) in support of critical mineral systems understanding.

Work Environment:

Working with a dynamic, innovative geoscience team with extensive research and development expertise in 3D geological and geophysical integration at Natural Resources Canada - Geological Survey of Canada, supporting our clean energy transition with the 3D Earth Imaging and Modelling group of the Critical Mineral and Geoscience Data Program. For background on Canadas Critical Mineral Strategy please see The Canadian Critical Minerals Centre of Excellence site:

<https://www.canada.ca/en/campaign/critical-minerals-in-canada.html>



Study Period: This Ph.D. will start in September 2023 and end in March 2027.

Pay: Scholarship of \$25,000/year divided into 3 equal installments each year. It is expected that the student will work approximately 10 to 15 hours per week for up to a three and a half year period. Interested students can get more details by sending an email to:



Dr. Eric A. de Kemp at eric.dekemp@nrcan-rncan.gc.ca as well as making an application at the RAP site (details below).

TO APPLY

Interested Candidates should apply through the Research Affiliate Program site at:

[PhD \(Bursary\) - Estimating Geofeatures with Agents \(cfp-psc.gc.ca\)](https://www.cfp-psc.gc.ca)

Closing Date: July 24, 2023 – 23:59, Eastern Standard Time

Information you must provide:

1. Your resume.

2. **A covering letter of approximately 1000 words** outlining your interest in the position, and relevant education/experience.

3. Currently enrolled, or willing to enroll, at a Canadian University in a PhD program with specialization relevant to the duties of the position.

4. Graduation with a Bachelor of Science in Geosciences, Computer Science and/or Computer Engineering or other relevant specialization from a recognized post-secondary institution.

Essential qualifications include:

5. Experience:

- Experience in 3D computer geometry algorithm development (Linear algebra, Spherical Geometry, C++, Python, R).
- Experience in software application development (Multi-Agent systems).
- Experience working individually and in teams.

6. Knowledge:

- Spatial Agent development.
- Tectonics.

7. Abilities:

- Oral and written communication in English essential.