

# Jesse Burke

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jesseburke

*Software engineer specialising in front-end development and computer graphics;  
former research mathematician; looking for challenges; excited to serve the customer.*

## Industry Experience

**Abyss Solutions**, *machine learning and robotics to automate inspection tasks.*  
**Fullstack software engineer**

**Jul 2022 – Dec 2023**  
*Sydney, Australia*

Product: Fabric, web app for inspecting and recording corrosion levels on off-shore oil-drilling platforms.

Tech stack: React (Next.js), Three.js w/ custom WebGL shaders for point cloud rendering, GraphQL, MongoDB.

- Implemented “point of interest” feature that allows a user to select a 3d point on the platform, label and comment on it, with an svg marker displayed there afterwards, visible to other users.
- One of two people working on computer graphics and performance among the web teams; had 2-4 gb point cloud inside a complex React app, so our performance budget was always in the red; some significant actions taken were:
  - constantly tuning point cloud octree and node loading
  - rewrote interface between React-app and graphics
  - upgraded to React 18, used new features
  - on-demand rendering and adaptive DPR
- Refactored large chunks of the front-end, simplifying and modularising; this allowed our three web dev teams to effectively collaborate and successfully meet a release deadline, after having been working independently in inefficient silos.
- Fixed several pernicious bugs in our patented blister measuring feature, over course of several months, e.g., different conventions used for orientations in: data processing, a serverless function, and the front-end.

**Archistar**, *property development software.*  
**Software engineer**

**Jan 2022 – June 2022**  
*Sydney, Australia*

Product: Snaploader, interactive 3d display of luxury real estate properties, for remote inspection.

Tech stack: Vanilla js front-end, Three.js, Ruby on Rails, PostgreSQL.

- Documented large full-stack codebase (50k+ lines in 10+ repos) written by one person no-longer employed by company.
- Streamlined and modernized build process, including adding a linter and code formatter.
- Planned detailed transition to React, from 6k loc file where DOM was constructed and styled by hand.

**University of Sydney, Dept. of Maths. and Stats**  
**Frontend developer**

**Jan 2019 – Nov 2020**  
*Sydney, Australia*

Product: 10 interactive 3d web apps for first year courses, used by lecturers and students.

Tech stack: React and Three.js, with custom data and graphics libraries (see Personal Projects below for links to repos).

- “Deep-linking” system: state is easily saved to address bar, so lecturer and students can share links.
- Apps are used in courses with total enrolment of 2000+ students/year.
- Tough weekly schedule of releases (e.g., needed to get certain app done for certain lecture).

## Programming: Languages and Skills

Expert: Javascript/Typescript, computer graphics (especially Three.js and WebGL), React.

Strong: data structures and algorithms, web app performance, HTML/CSS, GraphQL, MongoDB, shell.

Capable: node.js, Python, Ruby, C, SQL, Lisp (Emacs and Common).

Have used: Java, C++, Haskell, Clojure.

## Education

2005–2010 **Ph.D. Mathematics**, *University of Nebraska-Lincoln (UNL)*, USA.

2000–2004 **B.S. Mathematics, B.S. Computer Science**, *Syracuse University*, USA.

## Some Personal Projects (with links to Github repos)

- **differential-equations-apps** Six apps used for first year ODEs course; four are in 3d. In all apps, state can be saved and restored from the address bar.
- **vibrating-string-app** Used to illustrate the wave equation; 3d graph of function of two variables, and the 2d graph of the intersection with a plane.
- **three-scene-with-react** Library to build ThreeJS scenes with React; used in above two apps. When used with an atomic state library, makes it possible to write simple, declarative, and performant code for 3d graphics.
- **jotai-data-setup** Package of utils to work with the atomic state library Jotai. In particular, gives hooks to save and load state from the address bar.

## Summary and highlights of academic career

- The “Burke resolution” is a mathematical object named after me by David Eisenbud, Berkeley professor and former president of the American Mathematical Society, based on a paper I wrote.
- Held research postdoc positions at: Bielefeld University in Germany, UCLA (8th in Shanghai world rankings at the time), and ANU, respectively, from 2011 to 2018.
- My research areas were homological algebra, algebraic geometry, and representation theory.
- Wrote 10 research papers, four as the sole author; currently have 97 citations (as of Nov 2023).

## Relevant skills developed in academic career

- *Problem solving*: am excited to pursue hard problems in new areas.
- *Learning and teaching*: taught 21 university courses, and gave 10 reading courses to individual students. A large chunk of my teaching was at UCLA (11 courses), where my evaluation scores averaged 9.22/10.
- *Confident and clear communication*: delivered 38 invited seminar talks, including at Berkeley (x2) and Cornell.
- *Independence*: successfully completed years-long projects with minimal oversight.
- *Leadership*: developed especially by teaching courses with 200+ students and 10+ TA's.

## Hobbies

- President, and assistant coach, of the University of Sydney Wrestling and Grappling Club.
- Completed 200 hour yoga teacher training.