Benjamin R. Bray (Software Engineer, Tokyo JP)

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Education

- **Georgia Institute of Technology**, M.S. Computer Science — Atlanta GA, USA (2017-2019)
- **University of Michigan**, B.S. Mathematics — Ann Arbor MI, USA (2013-2017)

Technical Skills

- Languages: TypeScript, Haskell, Rust, Scala, Python, C#
- Frontend/Web: React, SolidJS, HTML/CSS, Vite, Webpack, WebGL, Rust+WebAssembly
- Backend/Server: NodeJS, Google Cloud Platform (GCP), PostgreSQL, ArgoCD, Terraform, GraphQL
- Development Tools: Git, GitHub, Docker, VSCode
- Subject Areas: rich text editors, functional programming, compilers, graphics & simulation

Work History

Research Software Engineer, National Institute of Informatics (Tokyo JP, Feb 2023 - Nov 2024)

- Designed a custom programming language, language server, and web-based IDE allowing automotive engineers to describe, validate, and visualize temporal properties of vehicle signal data.
- Proposed and implemented new language features & user experience improvements based on user feedback.
- Presented our work at the IAA Mobility 2023 automotive trade show in Munich, Germany.
- Tools:
  - **TypeScript** (React, Zustand, CodeMirror) to build a user-friendly code editor & validation tool.
  - **Haskell** for implementing parsers, typecheckers, interpreters, and the language server backend.

Backend Engineer, Smartpay K.K. (Tokyo JP, March 2022 - Feb 2023)

- Led the design, implementation, testing, and release of a *programmatic disbursements* backend service which integrates with bank APIs to automatically issue merchant payouts and consumer refunds.
- Code review, API design, sprint planning for a backend powering mobile & web apps for a pay-later service.
- A *functional core, imperative shell* architecture enabled my team to quickly build features & fearlessly refactor.
- Tools: Scala, `cats-effect`, GCP, PubSub, Terraform, GraphQL

Computer Vision Engineer, EmbodyMe (Tokyo JP, May 2020 - Feb 2022)

- Trained deep learning models to transfer facial expressions from input video onto a target image in real time.
- Implemented graphics post-processing effects. Surveyed recent research and presented my findings weekly.
- Tools: Python, Docker, PyTorch, ONNX, MediaPipe, GANs, NeRF, attention, transformers

Software Engineering Intern, Microsoft (Seattle, USA, May - Aug 2016)

- Built a multiplatform mobile app (C#/Xamarin) to display Windows telemetry metrics to developers.

Projects & Open Source

Noteworthy, a desktop Markdown editor for notes making heavy use of math and citations. (2020-)

- Authored many custom plugins for the ProseMirror editor framework and the Remark markdown processor.
- Implemented conversions between the ProseMirror document tree and Remark syntax tree formats.
- Designed a plugin architecture enabling mix-and-match of syntax extensions.
- For a full list of features, visit github.com/benrbray/noteworthy.
- Tools: TypeScript, SolidJS, Electron, ProseMirror, CodeMirror, KaTeX, Vite

prosemirror-math, adds interactive math editing support to the ProseMirror editor framework. (2020-)

- I originally created `prosemirror-math` to encourage more widespread adoption of user-friendly LaTeX math editing on the web. With ~2.4k weekly downloads on NPM and adoption by the Zotero reference manager, I like to think I've already had an impact! (visit github.com/benrbray/prosemirror-math)
- Tools: TypeScript, ProseMirror, KaTeX

remark-cite, adds support for pandoc-style citation syntax to the `remark` markdown processor. (2021-)

- Implements tokenization, parsing, and serialization for the new syntax, as well as a custom DSL for rendering bibliographies to plaintext or HTML using the extracted citations. Integrates with Astro.
- Serves as a complete, well-documented example of writing syntax extensions for `remark`.
- Tools: TypeScript, Remark (visit `github.com/benrbray/remark-cite`)

Independent Game Development, (see `benrbray.com/projects/flash-games`) (2009-2013)

As a teenager I published Flash games to Newgrounds, where I became part of a vibrant community of artists, musicians, and programmers with an infectious enthusiasm for game development. I learned early on to *love* the work that I do, and try to bring that same passion to every team I'm a part of.

Additional Projects, (see my website for details!)

- (`rust`) A 2D physics engine based on the classic *sequential impulse* algorithm for rigid body simulation.
- (`C++/CUDA`) Real-time simulation of incompressible fluid flow based on the classic "stable fluids" algorithm.
- (`haskell`) `yagi-lang`, a toy language for learning about dependent type theory & language servers.
- (`haskell`) `borscht`, a command line tool which queries the Discogs API to fill in missing music metadata.

Open Source, I'm quick to `git clone` software that I rely on. Here are a few of my contributions:

- `jgm/citeproc#88` extends the `pandoc` HTML target with support for hyperlinked bibliography titles.
- `jgm/citeproc#113` investigates & resolves a `pandoc` bug report related to hyperlinked titles.
- `beetbox/beets#3682` refactors the `beets` Discogs Plugin and allows it to activate in more situations
- `benrbray/tikzjax` My fork of `aristicat1/tikzjax` adds docs and a `Dockerfile` for reproducible builds.

Teaching Experience

As a graduate student at Georgia Tech, I served 2 semesters as a co-instructor (alongside my advisor) for an undergraduate-level algorithms course, and before that an additional 4 semesters as a teaching assistant. My responsibilities included:

- teaching one 50-minute lecture per week as a primary instructor, to classrooms of 30-60 students
- curriculum design and creation of new course materials (exams, homework, projects, lecture notes)
- facilitating weekly hands-on sessions, where students solve problems in small groups
- offering personalized help to students during my weekly office hours
- grading, tracking student progress, and adjusting the pace & content based on student feedback

Below is a full list of the courses I've assisted with:

- **Lecturer/GSI**, CS 4540, Advanced Algorithms for Machine Learning @ Georgia Tech (Fall 2018, Fall 2019)
- **Teaching Assistant**, ISYE 6740, Computational Data Analysis @ Georgia Tech (Spring 2020)
- **Teaching Assistant**, EECS 445/545, Machine Learning @ Michigan (Winter 2016, Fall 2016, Winter 2017)
- **Math Lab Tutor**, MATH 425, Intro Probability @ Michigan (Fall 2015, Winter 2016)