Joshua A. **Taillon**

RESEARCH SOFTWARE ENGINEER · MATERIALS RESEARCH ENGINEER · DATA SCIENTIST AND SOLUTIONS ARCHITECT

✉ jat255@gmail.com | 🏠 www.joshuataillon.com | ⌨ jat255 | 🔗 jat255 | ⚒ Google Scholar Profile | 🌐 Boulder, CO

Summary

I am an ***internationally recognized*** expert in **scientific data management**, real-world ***data engineering*** solutions, ***scientific programming***, and ***materials research***. Since 2018, I have spearheaded efforts to modernize data management practices at NIST in diverse domains ranging from electron microscopy, to mechanical materials testing, to biosystems and biomaterials research. I have **led technical development** on a range of impactful projects, focusing on ***Laboratory Information Management*** (LIMS) and experimental metadata capture, including both backend systems and frontend interfaces. I have led federally-funded working groups on advancing data management practices in materials research and am regularly invited to speak at both international and domestic scientific conferences.

I have a passion for ***open source software*** and sharing my knowledge and experience with others. I am a ⚒ *Software Carpentries* certified instructor and often run tutorial sessions and short course seminars on both general and scientific programming. I place great emphasis on building ***comprehensible***, ***well documented***, and ***scalable*** software solutions that empower researchers to accelerate scientific discoveries and leverage the latest AI/ML strategies. Outside of work, I regularly publish and contribute to various open-source side projects, have been a Linux enthusiast since 2010, enjoy building home and personal data automation pipelines and self-hosting applications, and am an avid cyclist.

Technical Skills

Scientific/General Programming	Python, JavaScript, R, MATLAB, OpenCV, Linux coreutils/bash, Java, LaTeX, HPC, Make Owner/maintainer of projects totaling nearly 1,000 stars on GitHub
Software Development/DevOps	Git, Docker, Github Actions, Azure pipelines, Gitlab CI/CD, Qt/Tk GUIs, Test-driven development, Python packaging (`conda`, `poetry`, `uv`, PyPI, etc.), Proxmox, Reverse engineering, Bluetooth LE communication
Data Engineering and Processing	SQL (PostgreSQL, SQLite, SQLAlchemy, SQLModel), Pandas, NumPy, NoSQL databases, web scraping, InfluxDB, Apache Airflow, Data modeling: LinkML, `pydantic`, JSONSchema, XML Schema/XSLT
Data Presentation	Plotly Dash, Streamlit, Jupyter Notebooks, Django, RShiny, Matplotlib, Reveal.js, RShiny
Machine Learning	Scikit-learn, Keras, TensorFlow
Materials Characterization	Extensive experience with FIB (Ga^+/Xe^+), SEM, TEM, Nanotomography, EDS, EELS, XPS, EBSD, XRD, etc.
Presentation/Writing	11 reviewed publications, 13 proceedings, 50+ presentations (21 invited) – 712 total citations; *h-index:* 11

Professional Experience

National Institute of Standards and Technology (NIST)
Boulder, CO

MATERIALS RESEARCH ENGINEER · OFFICE OF DATA AND INFORMATICS · DATA SCIENCE GROUP — *September 2018 - PRESENT*

Staff scientist at 🌐 *NIST*, working directly with researchers to address data and workflow challenges through novel data management solutions. I have in-depth technical proficiency as well as experience leading both project teams and federally-funded working groups. Highlights include:

- Designed, implemented, deployed, and maintained ⌨ usnistgov/NexusLIMS – a laboratory information management system (LIMS) to automatically harvest, categorize, and display data from dozens of electron microscopes and associated spectrometers (Python, Django, SQLite, MongoDB)
- Published ETSpy – ⌨ usnistgov/etspy – a HyperSpy extension package to facilitate electron tomographic data analysis (Python, Jupyter, Sphinx)
- Proposed, architected, and implemented an internal scheduling app to manage room utilization during the COVID-19 pandemic with calendaring, approvals, notifications, etc. for 800+ staff during NIST's hybrid work posture. (PostgreSQL, RShiny, PostgREST, Office 365 APIs, Python)
- Identified and deployed an electronic lab notebook platform (ELN) for use by research staff at NIST. Developed data models for microbial research workflows and an automated experiment metadata validation and export pipeline. (LinkML, `pydantic`, Python, Web APIs)
- Co-chaired a working group of the Materials Research Data Alliance (MaRDA) focused on producing recommendations for the use of LIMS in materials research environments (results published in the *MRS Bulletin*)
- Maintain and manage community for open-source hyperspectral data analysis software – ⌨ hyperspy/hyperspy (Python)

National Institute of Standards and Technology (NIST)
Gaithersburg, MD

NRC POSTDOCTORAL RESEARCH FELLOW · MATERIALS MEASUREMENT SCIENCE DIVISION — *October 2016 - PRESENT*

- Independently developed research proposal (accepted by the National Research Council) to explore the applications of compressive sensing during 3D SEM imaging and chemical analysis in the FIB-SEM in order to radically improve experimental throughput
- Innovated the use of beta process factor analysis to enhance interpretability of chemical EDS maps (using Matlab and Python)
- Quantified hyperspectral reconstruction quality using multiple image quality metrics (*e.g.* SNR, DIVINE, BRISQUE, etc.)

University of Maryland
College Park, MD

NSF GRADUATE RESEARCH FELLOW · DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING — *July 2011 - August 2016*

- Developed open-source electron and ion beam experimental and data processing methods to characterize various materials systems
- Established 3D nanotomographic methods to reconstruct fuel cell microstructures, processing over 10 GB of image data per experiment
- Used high resolution TEM and electron energy loss spectroscopy to investigate the effects of post-processing on SiC MOSFETs
- Formulated data processing pipelines for research group, transitioning GUI-based analyses reproducible notebook-based ones

Education

University of Maryland, College Park
College Park, MD

PH.D./M.S. IN MATERIALS SCIENCE AND ENGINEERING · GPA: 3.964 — *August 2016/May 2014*

- Thesis: *Advanced analytical microscopy at the nanoscale: Applications in wide bandgap and solid oxide fuel cell materials*

Cornell University
Ithaca, NY

B.S. IN MATERIALS SCIENCE AND ENGINEERING · *Magna cum laude* WITH HONORS · SENIOR RESEARCH THESIS — *June 2011*