Luke R. Johnson
1551 SW Taylor St, Portland, OR 97205
(215) 740-3237
lrjohn494@gmail.com

Dear Hiring Professor:

I am ecstatic to present my application for a postdoctoral role in your laboratory. I am currently a postdoc patent fellow working in intellectual property, which involve assisting with the preparation and prosecution of patent applications and preparing for the patent office exam. I graduated with a Ph.D. in Chemical Engineering from the University of Pennsylvania in 2021. My research involved generating data using density functional theory calculations to tune properties of 2D materials as catalysts for clean electrochemical reactions. Once collected, I preprocessed and cleaned data for utilizing machine learning algorithms and data science pipelines to perform exploratory data analysis, infer relevant material features, predict catalytic properties, and build simplistic models to improve fundamental scaling of chemical reactions. Within my research, I became proficient in Python, using numpy, pandas, os, PIL, and scikit-learn for numerical and statistical analyses. My research involved the use of Linux scripting to automate research workflows in high-performance computing. I also have experience in SQL and R to build pipelines for transforming and processing data. My passion for data exploration led to the development of notebooks on my GitHub page.

Given my research background and interests, I aspire to work on projects involving the design of a pipeline which combines data generation and analysis into a series of machine learning algorithms to make predictions on material properties. During my Ph.D. research, I found principal component analysis to be an excellent tool for grouping classes of materials without having to make predictions on quantifiable properties and hence limiting the search space for desirable substances, which would be suitable to explore in this role. The 2D MXenes I explored have intriguing electronic characteristics and sparked my interest in using data exploration in the discovery of photocatalysts, an area stifled in discovery relative to other material applications. Density functional theory in combination with high throughput computational screening would prove beneficial in suggesting composite materials based on electron transport and hole utilization that would be effective photocatalysts for applications like CO_2 reduction. Interestingly, the usage of semi-empirical methods to screen for the ability of a material to bind to a catalytic surface in general – the interaction between an adsorbate and surface, the electronic structure coupling, and temperature and voltage effects on this binding – can prove useful in screening charged based interactions in solar cell materials. Overall, I am interested in applying my ML applied knowledge to energy focused projects in a postdoctoral fellowship.

My multifaceted Ph.D. included strategic mentorship of B.S. and M.S. candidates, weekly deliverables of results to collaborators, independent project management, and writing reports or designing presentations for scientific communication. Beyond my graduate studies, I've spent my free time pursuing leadership in student government and conducting consulting for clients. I have a strong desire to either become a lecturer or a teaching professor, which led to my certification in University Teaching at Penn and taking on more engaging roles during my teaching assistantships. The toolsets obtained throughout my Ph.D. have honed my knack for surveying and exploring large amounts of complex data using hypothesis-based experimentation and uncovering key insights centered around supportive teamwork, proper budgeting, strong client relationships, and tight deadlines. A preference of mine would be having the ability to audit classes in machine learning, statistics, and material science in my spare time while conducting this role. I believe working in a training program of this nature will allow me the resources to continue training in data-based projects which suit potential directions which include but aren't limited to continuing in a data science specific fellowship, training undergraduate students to incorporate programming and data analysis into chemical engineering, or implementing data exploration and analysis to formulate business-oriented solutions and visually succinct stories in a more technical setting. Please find attached my C.V. to this statement. I thank you for reviewing my application in advance.

Sincerely,
Luke R. Johnson