

# Alex B Buettner

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## EDUCATION

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### Master of Science, Chemical Engineering

UNIVERSITY OF NEVADA, RENO

AUGUST 2016 – PRESENT

### Bachelor of Science, Chemical Engineering

UNIVERSITY OF NEVADA, RENO

MAY 2016

## EXPERIENCE

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### Machine Learning

UNIVERSITY OF NEVADA

MAY 2017 – PRESENT

#### Analysis, Characterization, And Prediction on Large Datasets

Use of various machine learning methods for predictive analysis of large datasets, with an emphasis on dependency extraction. Performed data embedding and clustering on high-dimensional data for visualization and classification. Handled data using neural networks and conventional machine learning techniques.

#### Development of Clinical Process Models from Historical Data

Using semi-supervised machine learning methods for rapid extraction of process dependencies and relationships. Developing and testing of a self-consistent machine learning framework for optimization of large scale processes.

#### High Entropy Alloy Data Mining

Development of machine learning framework for identification of novel HEAs using commonly available material properties data. Studied mixing characteristics of HEAs using excess entropy models.

### High Performance Computing

UNIVERSITY OF NEVADA

MAY 2017 – AUGUST 2017

#### High Performance Computing Systems Management

Installed and setup 64-node HPC cluster in large server environment. Deployed disk-less boot and redundant distributed storage across all nodes. System was deployed with resource management software (SLURM), Ethernet MPI, and InfiniBand hardware/software capabilities.

### Scientific Computing

UNIVERSITY OF NEVADA

MAY 2014 – MAY 2015

#### Metal Hexaboride Structure and Energetics Modeling

Developed and assisted with the generation of inter-atomic pair potentials from density functional theory (DFT) and molecular dynamics (MD) simulations. Published in J. Mater. Chem. C, 2015,3, 8649-8658

#### Structural Modeling of Reverse-Micelle Microreactors

Performed MD study of the stability and morphology of AOT/water/iso-octane reverse micelles. Applications included the use of molecular dynamics codes for prediction and optimization of AOT/water/iso-octane reverse micelles in solution. Utilized common pair potentials for biological systems.

#### Computational Fluid Dynamics

Simulated dynamic fluid systems using MFIX and other open-source codes. Applied high accuracy numerical integration and differentiation schemes for analysis of multi-dimensional fluid models.

## PUBLICATIONS AND PRESENTATIONS

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- 2018 **Clinical Model Development From Unsupervised Machine Learning Methods**  
*Publication, In Progress*
- 2018 **Real-Time Clinical Process Optimization via Machine Learning and Big Data Analysis**  
*Masters Thesis, In Progress*
- 2015 **Interatomic pair potentials from DFT and molecular dynamics for Ca, Ba, and Sr hexaborides**  
*J. Mater. Chem. C, 2015,3, 8649-8658*  
*DOI: 10.1039/C5TC01398D*
- 2014 **Ionic effects on the stability and morphology of AOT/water/iso-octane reverse micelles**  
*XXV International Materials Research Congress*  
*Cancun, Mexico, August 2014*

## SOFTWARE SKILLS

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MACHINE LEARNING	Two years of experience using machine learning frameworks such as sklearn, TensorFlow, and Keras for high-throughput data analysis. Development of various machine learning methods in both supervised and unsupervised learning environments, including hidden Markov models, mixture models, feed-forward neural networks, generative adversarial networks, and time-series predictive networks (LSTM). Experience with GPU applications of each of these methods.
SCRIPTING	Performed advanced studies using Python languages for five years in various scientific computing settings, including machine learning, computational fluid dynamics, and molecular dynamics. Experienced in statistical modeling, advanced numerical methods and computer algebra systems, as well as object-oriented coding with multiprocessing applications. Designed and configured customized small-scale agent-based modeling framework for use in research applications. Familiar with C++ as applicable to numerical methods and CUDA-based scripting.
LINUX/BASH	Used bash language for pre and post-processing of datasets and generating input scripts. Five years of experience writing automated wrapper scripts for various optimization and simulation codes, with an emphasis in error handling and continuous processing. Utilized Awk and Sed utilities for advanced manipulation of text files and data files. Advanced experience in setup and management of numerous Linux-based operating systems, including RHEL/CentOS, Ubuntu, and Debian.
HPC SCHEDULING	Installed and configured RHEL/CentOS HPC cluster equipped with SLURM resource manager. Handled the configuration of different resource allocations and ensured high-availability of partitions across the cluster for multiple users. Implemented high-availability distributed storage using GlusterFS in conjunction with high capacity conventional storage systems (RAID50).
MD CODES	Three years of working experience with various molecular dynamics software packages including HOOMD, GROMACS, and DLPOLY. Performed stability analysis of reverse-micelle systems using GROMACS, with cross-validation and speed-up characterization using the CUDA-accelerated HOOMD codes. Handled post-processing using automated scripts.

## TEACHING AND MENTORING

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TEACHING ASSISTANT	Acted as primary teaching assistant to a total of six classes over four semesters of graduate study. Lead lab sections for three classes with a total enrollment of over 50 students. Administered testing materials and proctored students during exams. Offered one-on-one and group review sessions, with an emphasis on an excellent base understanding of fundamental materials.
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