

CAL POLY HUMBOLDT
University Senate

Resolution to Recommend Machine Learning Certificate

X-24/25-ICC- - February 11, 2025 – Curriculum Reading

RESOLVED: That the University Senate of Cal Poly Humboldt recommends to the Provost that the Machine Learning Certificate detailed in proposal [24-2475](#) be approved.

RATIONALE: Machine learning is the ability of computers to detect patterns in data and use that information to make predictions. Applications of machine learning appear in recommendation systems, facial recognition, disease detection, etc., and will continue to change our world in profound ways. Machine learning expertise is a highly valued industry skill. There exist a number of certificates offered from institutions like MIT, UC Berkeley, UT Austin, UW. We would like to offer our Humboldt students training in this exciting and rapidly growing subset of AI.

Humboldt has launched a new Data Science major but currently does not have a way to target students in other majors who would like to obtain marketable data science skills other than offering our courses as electives with no coherent program. Moreover, it is challenging to communicate to individual students which specific courses would be most helpful for specific career skills (this is usually done between students and advisors and requires the advisors to know the course specific content, the current field which is rapidly evolving, and what our department offers).

By selecting coursework and packaging it into a tangible certificate that students can list on a resume, we will better be able to serve our students. Additionally, our data science courses weave the theme of “Data for Good” throughout– this is directly in line with Humboldt’s commitment to environmental and social justice and is good both for the University and for our students.

Specific to the Machine Learning Certificate, students will have the opportunity to learn essential concepts from statistical analyses and linear algebra, as well as supervised and unsupervised learning models for tasks such as forecasting and prediction. Machine learning has relevance to nearly every domain imaginable. For example, biologists use machine learning in medical image recognition tasks (Esteva, 2017), ecologists can use machine learning to predict species distribution or population dynamics (Pichler, 2023), economists can use machine learning in policy analysis (Athey, 2019), and political scientists can forecast election results with machine learning algorithms (Myilvahanan, 2023). Familiarity with concepts from this field prepares our students to enter a workforce or graduate program that values technical skills and also allows students to “look under the hood” to understand how many systems they already interact with are operating (e.g., autocomplete when texting).

References:

- Athey, Susan, and Guido W. Imbens. "Machine learning methods that economists should know about." *Annual Review of Economics* 11 (2019): 685-725.
- Esteva, Andre, et al. "Dermatologist-level classification of skin cancer with deep neural networks." *nature* 542.7639 (2017): 115-118.
- Mylvahanan, Karthick, et al. "A Study on Election Prediction using Machine Learning Techniques." *2023 Third International Conference on Artificial Intelligence and Smart Energy (ICAIS)*. IEEE, 2023.
- Pichler, Maximilian, and Florian Hartig. "Machine learning and deep learning—A review for ecologists." *Methods in Ecology and Evolution* 14.4 (2023): 994-1016.

Certificate Description:

The Cal Poly Humboldt Machine Learning Certificate provides an opportunity for students to study foundational statistics and linear algebra and then integrate ideas from these subjects in a study of supervised and unsupervised machine learning algorithms. Machine learning is used for prediction and forecasting and is applicable to nearly every discipline. Prerequisites: Data Cleaning and Visualization Certificate, MATH 101T or MATH 102 or an equivalent high school class or a specific ALEKS placement score of 78-100.

Includes the Following Courses:

- MATH 107 Introduction to Linear Algebra (3 units): Euclidean spaces, matrices and matrix arithmetic, solving systems of equations, and eigenvalues and eigenvectors. Emphasis on applications and use of computation.
- STAT 109 Introductory Biostatistics (4 units): Descriptive statistics, probability, random variables, discrete and continuous distributions, confidence intervals, contingency tests, regression and correlation, tests of hypothesis, analysis of variance. Emphasis: methods and applications used in the biological and natural resource sciences.
 - May be substituted for an advisor approved alternative.
- DATA 322 Machine Learning for Data Science (4 units): A broad introduction to machine learning, datamining, and statistical pattern recognition. Topics include: (i) Supervised learning (ii), Unsupervised learning and (iii) Best practices in machine learning. The course draws from numerous case studies and applications, with a practical rather than theoretical emphasis.

Humboldt currently offers the courses we are suggesting in each certificate. They are all courses in the Mathematics Department or the Computer Science Department. There is currently excess capacity in these courses, so this is an efficient way to use existing courses.

Related Certificates:

- [Data Cleaning and Visualization Certificate - 23-2462](#)
- [Database and Data Analysis Certificate - 23-2474](#)