Machine Learning

Employer Signaling System by the Greater Washington Partnership

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Mathematical & Statistical Machine Learning

Label	KSAC Description	KSA	Bloom's Taxonomy Level
a	Explain core statistical inference concepts (for example, deriving relevant hypotheses, evaluating the hypotheses, and prediction with uncertainty).	knowledge	2
b	Explain and demonstrate how differences in data and desired outcomes impact the appropriateness of data analysis techniques (e.g., descriptive vs. diagnostic vs. predictive vs. prescriptive).	knowledge	2
c	Explain core probability concepts (e.g., random variables, key distributions, conditional probability, Bayes theorem).	knowledge	2
d	Describe when and why one should use Machine Learning (compared to other techniques).	knowledge	2
e	Describe the limitations of machine learning.	knowledge	2
f	Apply principles of matrix algebra to linear transformations.	skill	3
g	Translate textual data into mathematical vectors.	ability	3
h	Demonstrate an understanding of cloud architecture and the capabilities of services such as AWS, Azure, IBM, Oracle and Google.	knowledge	2
i	Explain why training data must reflect real-world dynamics for machine learning models to perform as intended	knowledge	2

Machine Learning Models & Algorithms

Label	KSAC Description	KSA	Bloom's Taxonomy Level

a	Define key terms of machine learning, including natural language processing.	knowledge	1
b	Explain the difference between classification and regression problems.	knowledge	2
c	Explain the difference between clustering and association problems.	knowledge	2
d	Explain the difference between supervised and unsupervised machine learning, including the limitations of each.	knowledge	2
e	Explain at least three key supervised learning methods. For example, linear/logistic regression, decision trees, random forest, boosted trees, support vector machines, and neural networks.	knowledge	2
f	Explain major deep learning architectures (e.g., multilayer perceptron, feed forward network, CNN, RNN, LSTM, etc.) and when each is best applied.	knowledge	2
g	Explain key unsupervised learning methods, including k-means clustering, hierarchical clustering, association rules, and principal components analysis.	knowledge	2
h	Identify and recognize the clusters of common machine learning applications and limitations.	knowledge	2
i	Identify and recognize use cases to common machine learning applications.	knowledge	2
j	Understand the prerequisites and success criteria for machine learning.	knowledge	2
k	Explain the differences between basic learning algorithms and their applications.	knowledge	2
l	Explain the role and importance of model validation and accuracy metrics in analytics projects, hypothesis testing, and information retrieval.	knowledge	2
m	Explain efforts to make comples machine learning algorithms more explainable, such as Shapley values and/or LIME.	knowledge	2
n	Identify pros and cons of different machine learning algorithms.	knowledge	2
o	Implement, train, and validate a neural network.	skill	3

Data Visualization and Communication Data Interpretation, Visualization, and Communication

Label	KSAC Description	KSA	Bloom's Taxonomy Level
a	Explain the role of data visualization in discovery, communication, and decision-making.	knowledge	3
b	Create clear and appropriate data visualizations to communicate machine learning results to non-technical audiences	skill	2
c	Properly define a problem in context, use appropriate data, and deliver a compelling visualization to explain or answer a question.	ability	3
d	Understanding of ADA/508 compliance for accessibility.	knowledge	1

Application of Machine Learning Models & Algorithms

Label	KSAC Description	KSA	Bloom's Taxonomy Level
a	Explain evaluation metrics for machine learning algorithms (e.g., accuracy, precision/recall, ROC curves, R^2).	knowledge	2
b	Identify the role of computational resources (e.g., CPUs, GPUs, memory, scalability) in training and deploying machine learning models	knowledge	2
c	Describe approaches to test for bias in data.	knowledge	2
d	Explain key troubleshooting techniques for machine learning algorithms (e.g., evaluate bias-variance tradeoff, use cross-validation).	knowledge	2
e	Explain how data quality and representativeness impact model performance and deployment outcomes	knowledge	2
f	Explain sampling methods with respect to different applications, i.e. error estimates, surveys, A/B-testing.	knowledge	2
g	Train a machine learning model and use it to make predictions.	skill	3

Label	KSAC Description	KSA	Bloom's Taxonomy Level
h	Perform data manipulation using appropriate tools and software.	skill	3
i	Provide rationale for selecting the appropriate sampling methodology.	skill	3
j	Use AI-assisted tools responsibly to support model development, troubleshooting, and interpretation while knowing when outputs must be verified	skill	2

Data Ethics

Label	KSAC Description	KSA	Bloom's Taxonomy Level
a	Identify the established ethical and legal issues in data management facing organizations.	knowledge	2
b	Distinguish between technical feasibility and appropriate use of machine learning in applied contexts	knowledge	2
c	Identify the established ethical and legal issues in data management facing organizations.	knowledge	2
d	Apply ethical and compliance considerations when making or supporting data-driven decisions	ability	2
e	Explain the important issues around data governance.	knowledge	2
f	Present real world examples of data bias and the unintended consequences of using analytics, machine learning, and AI in making decisions.	knowledge	2
g	Explain the importance of provenance, transparency, and explainability in building trust in machine learning systems.	knowledge	2
h	Explain the importance of personal privacy issues related to the collection and usage of data.	knowledge	2
i	Explain the limitations and potential unintended effects of machine learning when such algorithms encounter new scenarios.	knowledge	2

Label	KSAC Description	KSA	Bloom's Taxonomy Level
j	Explain how scale, automation, and data volume can amplify errors, bias, and unintended consequences in machine learning systems	knowledge	2
k	Explain individual and data bias and the implications each has in data analysis.	knowledge	2