INTERNSHIP REPORT

John Cooper
• PNNL listing was on Handshake
• All applications were cold-call resume submissions
• Advice:
  ➢ Apply to organizations that you truly want to work for
  ➢ Government organizations are in competition with industry
  ➢ Network

https://sankeymatic.com/build/
EMPLOYER ORGANIZATION

Govt.
- D.O.E.
- Labs
- PNNL
- Directorates
- National Security
- Sustainable Energy
- Division
- Computing and Analytics
- Physical Sciences
- Program
- National Security Internship Program
- Minority-Serving Institution Partnership Program
EMPLOYER ORGANIZATION

• While Pacific Northwest National Laboratory (PNNL) is a DOE laboratory, it can also receive funding for projects from other government organizations such as the Department of Defense (DOD).
• The National Security Internship Program is funded by a subdivision of the DOD called the Defense Threat Reduction Agency (DTRA).
The internship consisted of an R&D competition between three teams, each comprised of a mix of data scientists and developers.
PROJECT DESCRIPTION

Imbalanced Data

Small Data (N = 1680)

Dangerous Co-drift
PROJECT DESCRIPTION

Chemical Sensor with inadequate ML backend

Small Data

Imbalanced Data

Chemical Co-drift

High False Positive Rate
PROJECT DESCRIPTION

- Small Data
- Imbalanced Data
- Chemical Co-drift

Chemical Sensor with Few-Shot Backend

Low False Positive Rate
TECHNIQUES

Basic 1D CNN

2D CNN + Recurrence Plots

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TECHNIQUES

Autoencoder for Anomaly Detection

Compact Convolutional Transformer
TECHNIQUES

Principal Component Analysis  Support Vector Machines  Random Forests

= knew before internship

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TECHNIQUES

Twin Networks
TECHNIQUES

Twin Networks

$N_{\text{train}} = 1680$
$N_{\text{test}} = 6000$

$FP = 0.26\%$
$FN = 0.52\%$
TECHNIQUES

Twin Networks

$N_{\text{train}} = 110$
$N_{\text{test}} = 6000$

$FP = 2.1\%$
$FN = 1.8\%$
SOFTWARE

- Python
- X
- TensorFlow
- Keras
- spyder
- P
- Slurm workload manager
- Git
- Bitbucket
- Jira

= knew before internship
SKILLS FOR SUCCESS

Technical
- Programming
- Mathematical Fluency
- Research
- Version Control

Soft
- Public Speaking
- Communication
- Collaboration
- Feedback Reception

Other
- Passion for Machine Learning
- Deep Interest in the Problem
- Failing Early and Often
- Fast Adaptation
OPPORTUNITIES AT PNNL

For more information, contact:
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Artificial Intelligence and Data Analytics Division

National Security Internship Program

INTERN JOB POSTINGS
- Undergraduate Tech Intern: 4773
- Post Bachelors RA: 4776
- Masters Intern 4774
- PhD Intern: 4775

Applied AI Systems
Foundational Data Science
Human-Centered Computing
Math, Stats, and Data Science
Software Engineering and Architectures

https://www.pnnl.gov/national-security-internship
https://careers.pnnl.gov/
REFERENCES


THANK YOU

John Cooper