SDSU & NRP Nautilus for Instruction

5NRP
Mach 21, 2024

Presentor

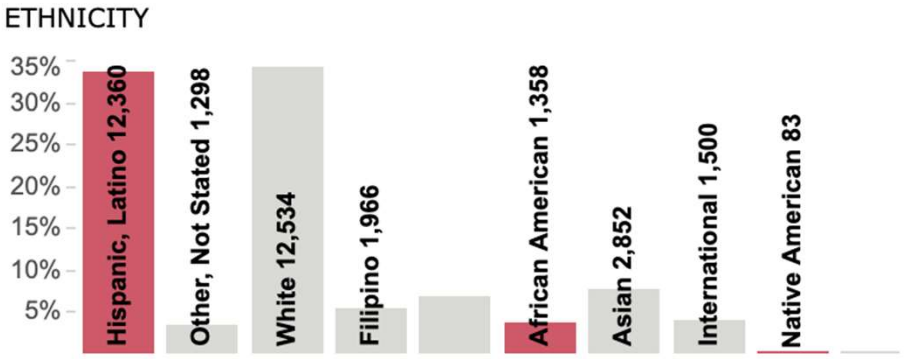
Michael Farley
Chief Technology Research Officer
San Diego State University
mfarley@sdsu.edu
it.sdsu.edu/research

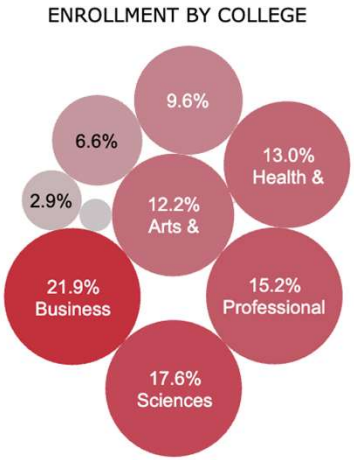
Agenda

- About SDSU
- Work in the AI Space
- Where to Start
- Networking
- Bring Your Own Resource
- Software Factory
- Course Usage
- What We've Learned

About SDSU

The mission of San Diego State University is to provide research-oriented, high-quality education for undergraduate and graduate students and to contribute to the solution of problems through excellence and distinction in teaching, research, and service.





109,215
Total Applications

32,064
Total Undergraduate Enrollment

4,508
Total Graduate Enrollment

AI Student Survey

>20%

SDSU Student Response Rate
(n = 7,811)

86%

Say AI will become an essential part of most professions

51%

Report that they regularly use AI in their coursework

34%

Report instructors encourage use of AI in coursework

https://it.sdsu.edu/projects-innovation/ai
https://scholarworks.calstate.edu/concern/publications/qj72pf459

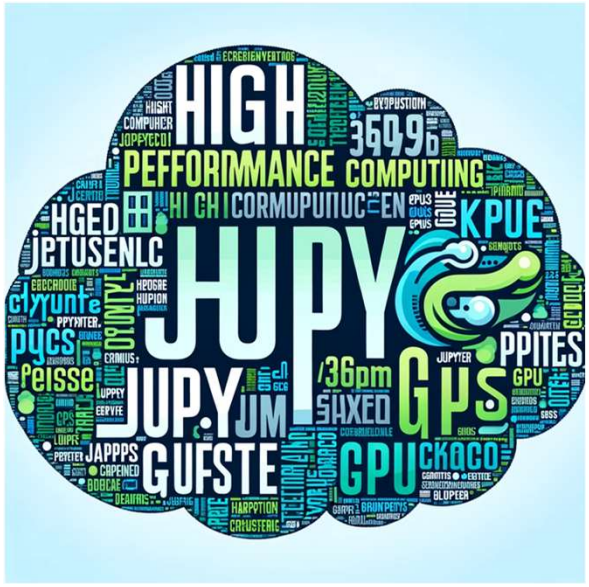
AAAI Micro-Credential

SDSU's Academic Applications of AI (AAAI) Micro-Credential prepares you to apply generative AI (gAI) technology efficiently, effectively, and ethically to level up learning in the classes you teach. Topics covered include:

- AI badge
- Overview: How Does gAI Work?
- Ethics & Responsible Use
- What Can AI Do?
- Finding Apps
- Prompt Engineering Activities

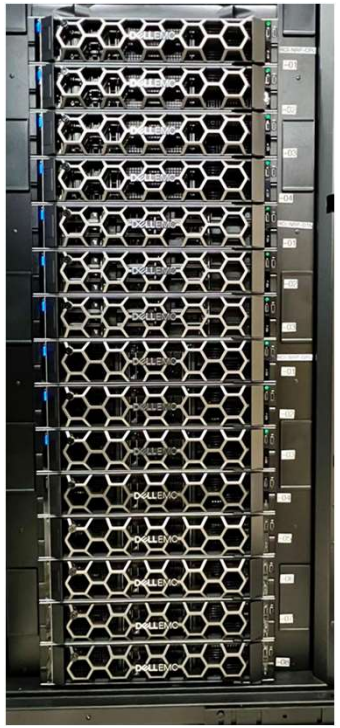
Where to Start - Understanding Needs

- Cyberinfrastructure committee formed
- Faculty led with representatives from all colleges
- Surveyed colleagues needs
- Several clusters led us to Nautilus
  - JupyterHub
  - High Performance Computing
  - GPUs



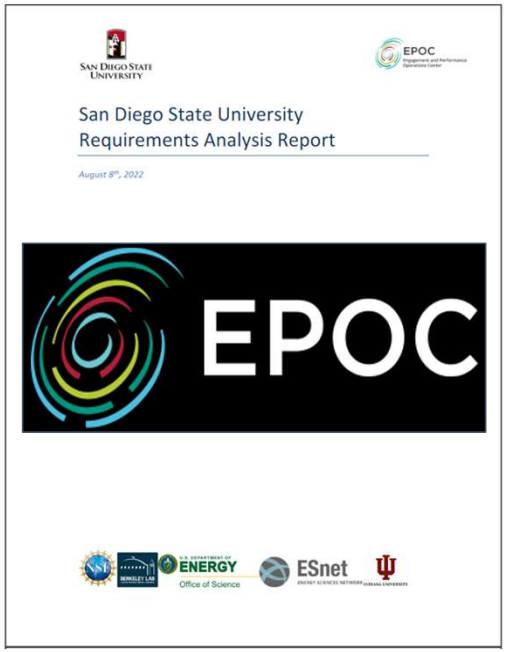
NRP "Bring-your-own-resource"

- NRP Nautilus is made up of resources that have been funded as part of grants, by institutions, labs, etc…
- NRP provides the administration
- Networking requirements, including a Science DMZ
- There is no requirement to bring resources - use what's already there!



EPOC Deep Dive

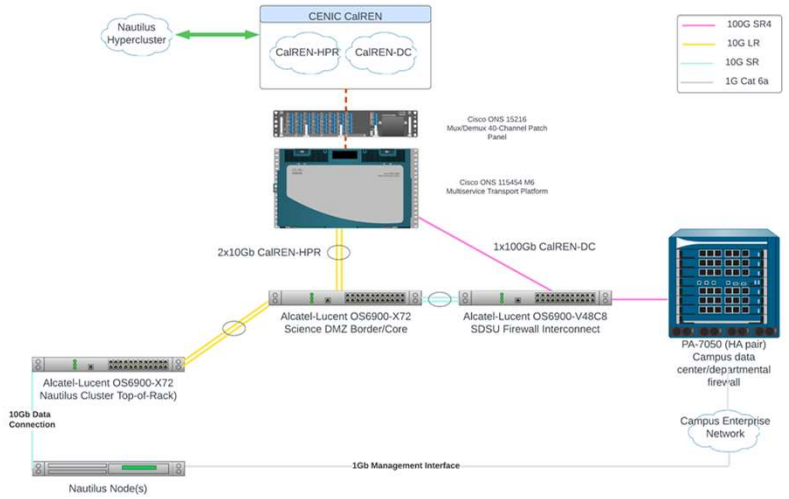
- Engagement and Performance Operations Center (EPOC) Application Deep Dive
- Focus on network as key component of science driver
- Led to better understanding of researcher needs
- Recommendations and findings provided a focus area for CI improvements, specifically networking



https://epoc.global/
https://escholarship.org/uc/item/82d7b7b5

Science DMZ

- SDSU was able to re-use a core router and switch after an enterprise network upgrade
- Added two CENIC HPR connections to provide the Science DMZ its connectivity
- While not perfect, it's working with plans to upgrade connectivity this year.



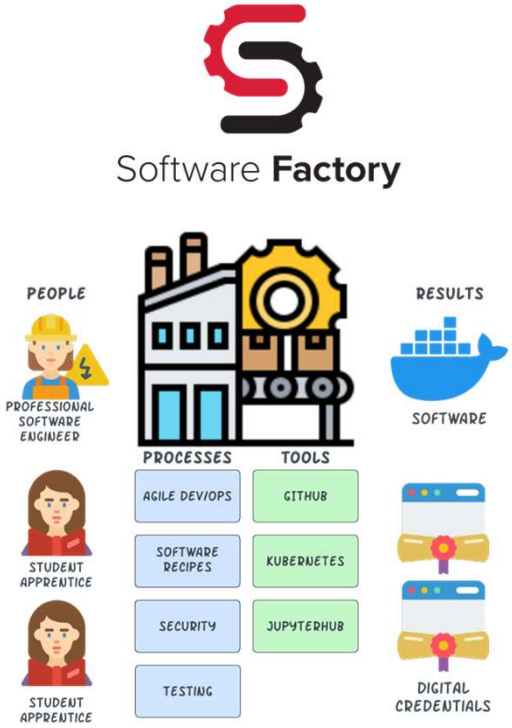
VERNE: Visionary Education Research Network Environment

- SDSU's instructional cluster funded by the university
- Fifteen CPU, GPU, and storage servers added to NRP
- Managed JupyterHub (Python, C, R, RStudio, MATLAB, Visual Studio Code, Linux Desktop, Eclipse, SageMath)
- Spare cycles available to researchers and other users of NRP Nautilus

https://github.com/SDSU-Research-CI/

Software Factory

- Student-centric, employing our students to be part of a real team with real outcomes
- Focus on educating our future workforce by focusing on industry standard DevOps practices and tools
- Research software engineers and students support faculty helping to containerize workloads and provide the onramp to VERNE usage



Course Usage

- Start Slow! Initially worked with three professors
- Getting the word out:
  - Department meetings
  - Word of mouth
  - University-wide communication
  - “Yelp!” reviews

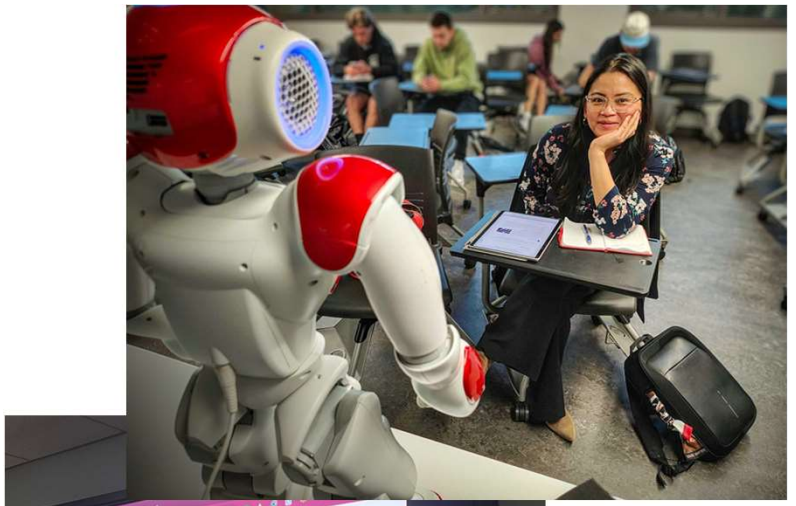
- Spring 2024:
  - Courses: 14
  - Students: 297
- Fall 2023:
  - Courses: 9
  - Students: 243
- Spring 2023:
  - Courses: 3
  - Students: 56

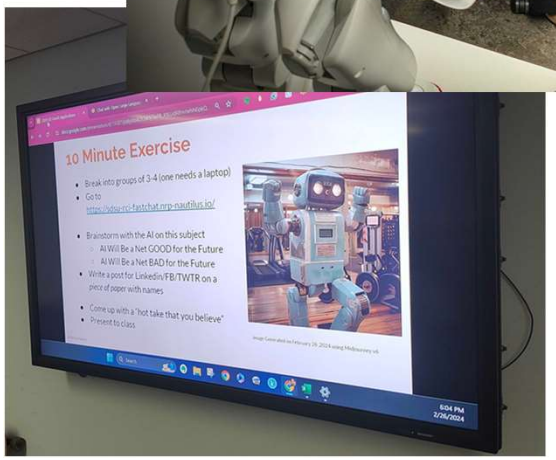
Spring 2024 Course Usage

ASTR 201 Astronomy for Science Majors	LING 572 Python Scripting
ASTR 350 Astronomical Techniques	LING 581 Computational Linguistics
BDA 572 Python Scripting	LING 583 Statistical Methods in Text Analysis
BDA 600 Big Data Capstone Seminar	MATH 596 Discrete & Algebraic Structures
COMPE 361 Advanced Programming	MATH 621 Advanced Topics in Algebra
CS 581 Computational Linguistics	MIS 760 AI/ML for Cybersecurity & Defense
GEOG 580 Data Management for GIS	MIS 429 Artificial Intelligence

MIS 429: Artificial Intelligence

- Leverage Large Language Models (LLMs)
  - Python and OpenAI API
  - Prompt Engineering
- Deployed FastChat to provide Web and API access to various models

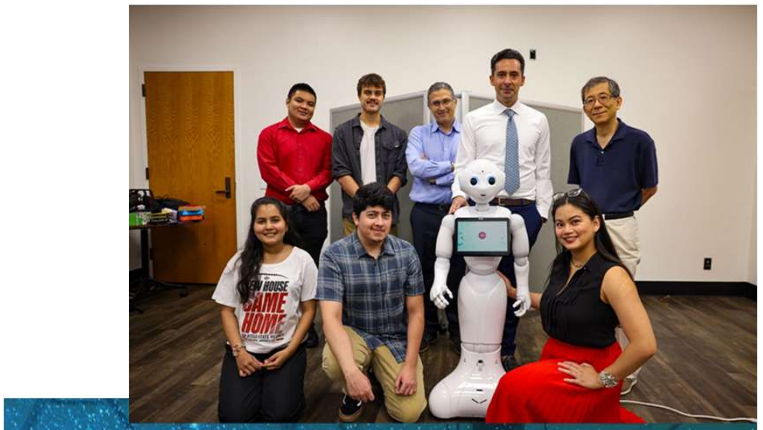




James Silberrad Brown Center for Artificial Intelligence

- Research focuses on social robots, artificial intelligence, cybersecurity, augmented/ immersive/virtual reality, foundational models, human-computer interaction, and mental health

- Utilizing Nautilus for LLM model training, fine-tuning, and hosting



https://business.sdsu.edu/centers-institutes/ai

The Cancer Health Equity & AI Research Lab

SDSU
San Diego State University

Leveraging computational analysis and machine learning to characterize COPD susceptibility in the National Lung Screening Trial (NLST) dataset

Gianni Pucillo, Dr. Uduak Z George

CSRC
csrc.sdsu.edu

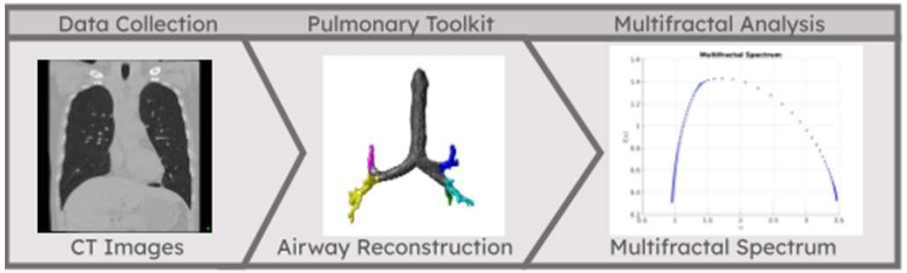
Background

- COPD is one of the leading causes of death worldwide
  - Pronounced in lesser developed countries
- Many factors have been associated with COPD, but not been analyzed together

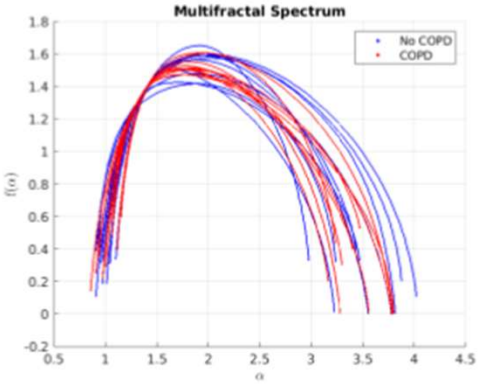
Purpose

- Identify potential new diagnostic metrics
- Evaluate potential of computational methods in pulmonary disease assessment
- Assess collective impact of various factors on susceptibility to COPD
- Develop computational pipeline integrating image analysis, multifractal theory, and machine learning with patient data

Computational Framework



Results



	Area	Height	Width
% Difference (Mean)	3.7496	3.6778	6.1613
% Difference (Median)	39.401	1.4979	0.67892

What We've Learned

- Containers are not that easy (Software Factory helps)
- Utilize what's already there (i.e. existing containers)
- Nautilus is a research resource - doesn't always fit our need for 24/7 uptime
- Growth is slow, but steady
- Not everyone needs GPUs
- Support has not been overwhelming
- Better Together - The NRP community is its real secret!

Get Started Today!

- Find out what your faculty and researchers need
  - Survey
  - Consider a Faculty Fellowship
  - Department meetings
- Start those conversation with your networking and security teams
  - EPOC
  - REN
- Figure out how you plan to support it
- Join the community
  - Matrix

Thank You

Q&A