

EXPANDING NRP USAGE WITH JUPYTER AT CAL STATE SAN BERNARDINO

YOUNGSU KIM ASST PROF OF MATH & HPC FACULTY FELLOW
DUNG VU HPC ANALYST

5th NRP
3/22/2024

ACKNOWLEDGEMENT

Part of our presentation was borrowed and modified from the work of our CFO & VP of FTO Sam Sudhakar



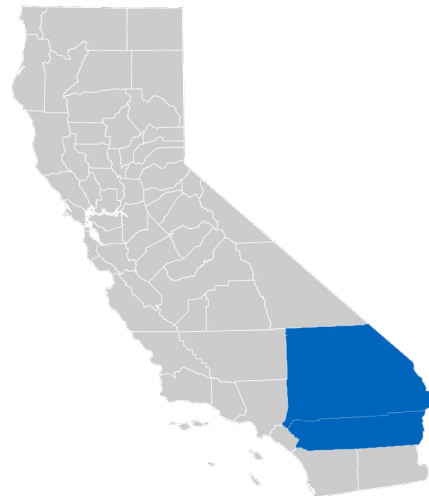
CALIFORNIA STATE UNIVERSITY SAN BERNARDINO (CSUSB)

- < part of CSU system, 23 campuses
- < located in near San Bernardino Mountains
- < more than 70 traditional degree programs
- < education credential and
certificate programs, a doctoral program
- < R2 in 2022 but primary focus on education



CSUSB (cont'd)

- < 1,100 faculty members
- < 19,000 students
- < Serves 2 of CA's largest counties
- < Hispanic Serving Institution
- < 57% Pell Grant recipients
- < Many student oriented projects



FACULTY LED RESEARCH

- < CSUSB is in the top five CSU institutions for Faculty-Led Research
 - \$44M in federal funding in 2022-2023
- < Most funded research projects did not require high-performance computing
- < But when needed, faculty went on their own to garner resources from their colleagues and partner institutions

THE NEED

- < Needed to find resources for faculty seeking HPC resources
- < Didn't necessarily have the funding, expertise, or the resources to build an infrastructure in-house
- < Experimented with building an HPC Cluster with hopes of securing NSF funding to build an infrastructure

EXPLORATION OF RESOURCES OUTSIDE CSUSB

- < In 2015 Library Dean Caballero connected our faculty with Extreme Science and Engineering Discovery Environment (XSEDE now ACCESS) team
- < Transition from XSEDE to San Diego Supercomputing Center
- < In 2017 CENIC introduced us to the Pacific (National) Research Platform

CSUSB JOINS THE NRP

- < In June 2017 CSUSB became a part of the NRP
the second CSU to become a part of this prestigious research network
- < Created a Science DMZ to get connected to the Platform
- < In 2018 James Macdonell and Dr. Dung Vu attended the FIONA workshop at the CENIC Annual Conference
- < Currently CSUSB has three nodes dedicated to the NRP
 - perfsonar.csusb.edu
 - csusb-sci-103-11.csusb.edu
 - gpu-01.csusb.edu

HPC PROGRAM TEAM

- < **Dr. Dung Vu** Information Security & Emerging Technologies Lead Research Computing Analyst
- < **James Macdonell** Interim Information Security Officer
- < **Dr. Youngsu Kim** 2021-2024 HPC Faculty Fellow & Assistant Professor of Mathematics
- < **Gerard Au** Chief Information Officer
- < **Dr. Bradford Owen** Associate Vice President of Faculty Development and Chief Academic Technology Officer

HPC ACTIVITIES AT CSUSB

Faculty-led Projects

- < Dr. Cousins, Dr. Kim, Dr. Meyer, Dr. Pham, Dr. Ratnasingam, Dr. Salloum, Dr. Zhang, Dr. Alavi & Dr. Mohabbati, Dr. Becerra, Dr. Liszka & Dr. Kraemer

Research Groups

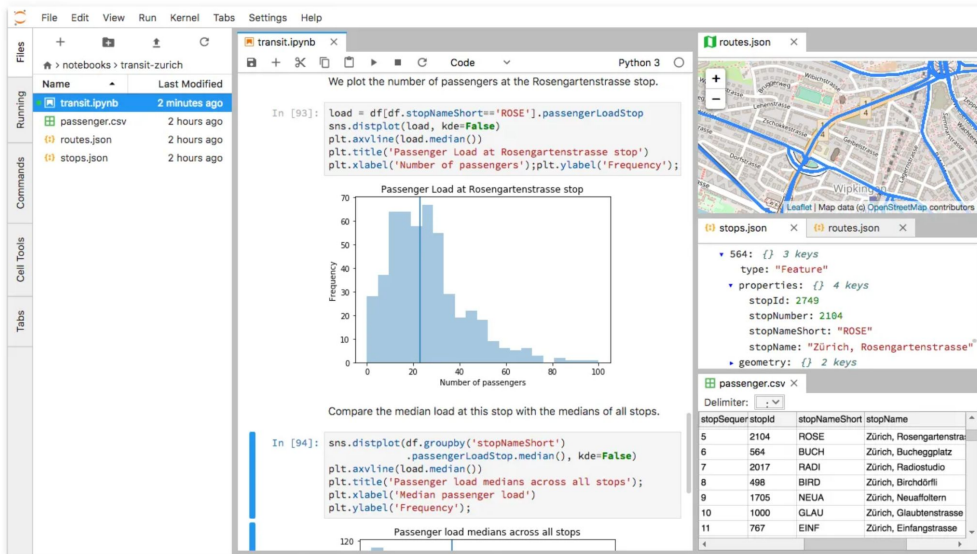
- < Center for Advanced Functional Materials, Data Analytics Working Group, William and Barbara Leonard Transportation Center

We Support Courses

- < BIOL 5050, CSE 5160, CHEM 5002, IST 2510, IST 6110, IST 6620, MATH 3465, MATH 6016

Nearly all the projects, workshops, and classes are supported by JupyterHub

JupyterLab/Hub



The screenshot displays a JupyterLab notebook with the following components:

- Files Panel:** Lists files including `transit.ipynb` (2 minutes ago), `passenger.csv` (2 hours ago), `routes.json` (2 hours ago), and `stops.json` (2 hours ago).
- Notebook Cell:** Contains Python code for data analysis:

```
In [93]: load = df[df.stopNameShort=="ROSE"].passengerLoadStop
sns.distplot(load, kde=False)
plt.axvline(load.median())
plt.title('Passenger Load at Rosengartenstrasse stop')
plt.xlabel('Number of passengers');plt.ylabel('Frequency');
```
- Figure:** A histogram titled "Passenger Load at Rosengartenstrasse stop" showing the frequency distribution of passenger counts. The x-axis is labeled "Number of passengers" (0-100) and the y-axis is "Frequency" (0-70).
- Code Cell:** Contains Python code for comparing medians:

```
In [94]: sns.distplot(df.groupby('stopNameShort')
    .passengerLoadStop.median(), kde=False)
plt.axvline(load.median())
plt.title('Passenger load medians across all stops');
plt.xlabel('Median passenger load');
plt.ylabel('Frequency');
```
- Figure:** A partial histogram titled "Passenger load medians across all stops" with an x-axis from 0 to 120.
- Map Panel:** Shows a map of the Rosengartenstrasse stop area in Zürich.
- JSON Viewer:** Displays the structure of `stops.json` for stop ID 2749:

```
{
  "type": "Feature",
  "properties": {
    "stopId": 2749,
    "stopNumber": 2104,
    "stopNameShort": "ROSE",
    "stopName": "Zürich, Rosengartenstrasse"
  },
  "geometry": {
    "type": "Point",
    "coordinates": [
      8.4515,
      47.3715
    ]
  }
}
```
- CSV Viewer:** Displays a table of stop data:

stopSequencer	stopId	stopNameShort	stopName
5	2104	ROSE	Zürich, Rosengartenstrasse
6	564	BUCH	Zürich, Bucheggplatz
7	2017	RADI	Zürich, Radiostudio
8	498	BIRD	Zürich, Birchdörfli
9	1705	NEUA	Zürich, Neuaufhorn
10	1000	GLAU	Zürich, Glasbänstrasse
11	767	EINF	Zürich, Einfaltstrasse

JupyterLab is a highly extensible, feature-rich notebook authoring application and editing environment, and is a part of Project Jupyter...


Source: JupyterLab Documentation

JupyterLab

TensorFlow 2 quickstart for beginners 

 Run in Google Colab


 View source on GitHub

 Download notebook

 PyTorch

Table of Contents

 Run in
Microsoft Learn

 Run in Google
Colab

 Download
Notebook

Sample Sales Data

Denormalize Sales Data : Segmentation, Clustering, Shipping, etc.

Data Card Code (77) Discussion (10) Suggestions (0)

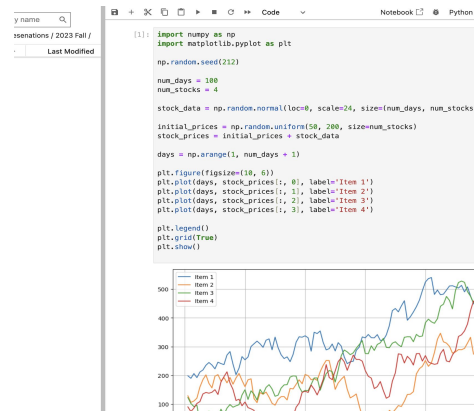
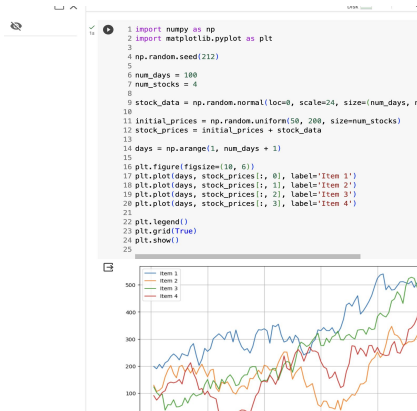
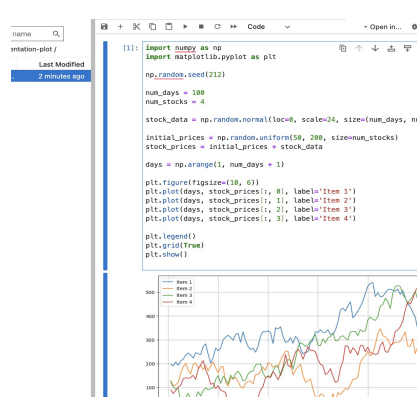
Dataset Notebooks

 Search notebooks

All Your Work Shared With You Bookmarks

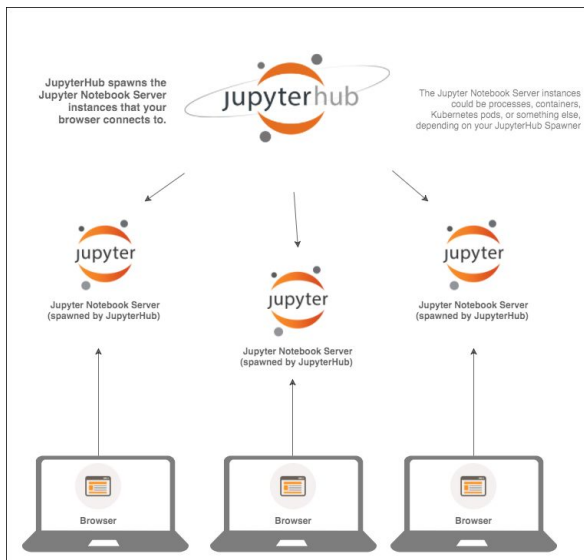
Source: TensorFlow, PyTorch, Kaggle Webpages

JupyterLab (cont'd)



JupyterLab Notebook on Google Colab, My Office Computer, NRP server

JupyterHub/NRP



Source: OpenCredo.com

☰ Nautilus documentation



Deploy JupyterHub

This guide is based on the instructions from the admin of the name

Start from choosing

CSUSB
WE DEFINE THE *Future*

CoyoteID (e.g. 001234567)

Password

Sign in →

NRP Documentation, CILogon, CSUSB IDP

CUSTOMIZED PAGE & SUPPORT

Welcome to Cal State San Bernardino JupyterHub
dedicated to Dr. Bree Putman Lab

Please use this server for your class/research with Dr. Putman only.

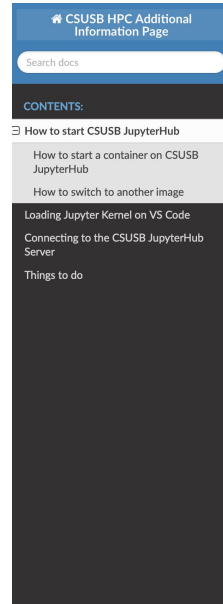
The login process (the orange button) uses CSUSB's DUO system

Sign in with CILogon

Be sure to choose California State University San Bernardino on the next page instead of ORCID

[Click here for more details](#)

This JupyterHub is provided by the [High Performance Computing Program](#) at California State University San Bernardino and National Research Platform. If you obtain any results by utilizing our resources, please include [acknowledgements of our service](#) in your work e.g., presentations or papers. It will help us maintain the funding for our resources.



CSUSB HPC Additional Information Page

Search docs

CONTENTS:

- How to start CSUSB JupyterHub
 - How to start a container on CSUSB JupyterHub
 - How to switch to another image
- Loading Jupyter Kernel on VS Code
- Connecting to the CSUSB JupyterHub Server
- Things to do

» How to start CSUSB JupyterHub

View

How to start CSUSB JupyterHub

Note

If you have any questions or find errors on this page, please contact the HPC faculty Youngsu Kim at youngsu.kim@csusb.edu.

Warning

The purpose of these instructions is not to provide the most thorough information these should be thought of as the minimal set necessary to start your project. To that end, we provide the links to official instructions.

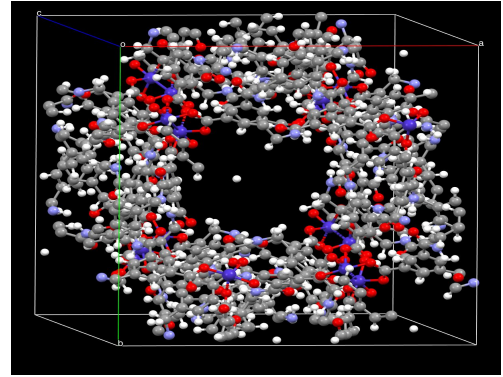
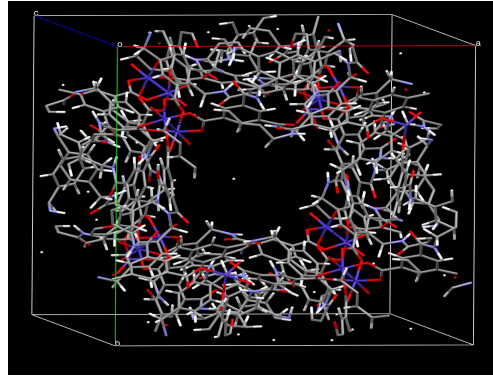
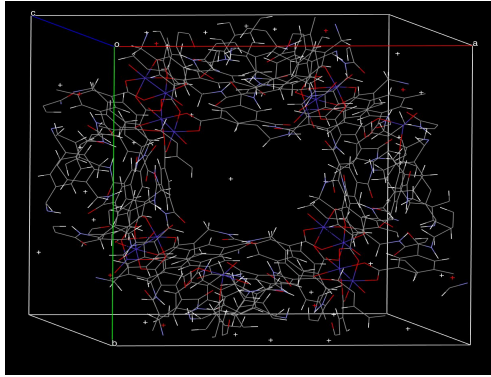
How to start a container on CSUSB JupyterHub

The following steps will guide you through the login process and image selection on JupyterHub hosted at <https://csusb-jupyter.nrp-nautilus.io/>.

1. Open your browser and navigate to <https://csusb-jupyter.nrp-nautilus.io/>.



WORK OF DR COUSINS WITH VASP



DR COUSINS (Cont'd)

Server Options

Spawning server for 000065181@csusb.edu

Advanced Options

Click the slider to adjust values; once clicked arrow keys can be used

GPUs max 8 default 0

GPU type

Cores max 256 default 4

RAM, GB max 1024 default 16

Click this to use dedicated nodes for CSUSB (under testing)

Image

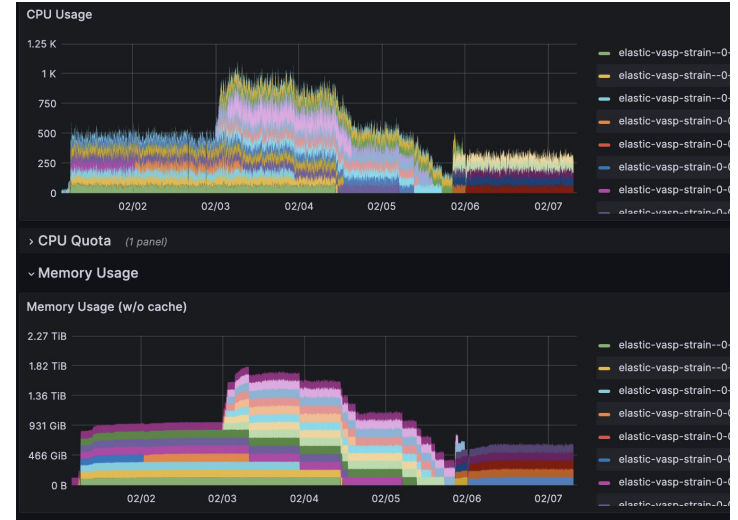
Stack Minimal

```
Terminal 3 Terminal 2
=====
No GPU detected

:: initializing oneAPI environment ...
bash: BASH_VERSION = 5.0.17(1)--release
args: Using "sg" for setvars.sh arguments:
:: advisor -- latest
:: ccl -- latest
:: clck -- latest
:: compiler -- latest
:: dal -- latest
:: debugger -- latest
:: dev-utilities -- latest
:: dnnl -- latest
:: dpccpp-ct -- latest
:: dpi -- latest
:: inspector -- latest
:: ipp -- latest
:: ippcp -- latest
:: ipp -- latest
:: itac -- latest
:: mkl -- latest
:: mpi -- latest
:: tbb -- latest
:: vtune -- latest
:: oneAPI environment initialized ::

Vendor ID: AuthenticAMD

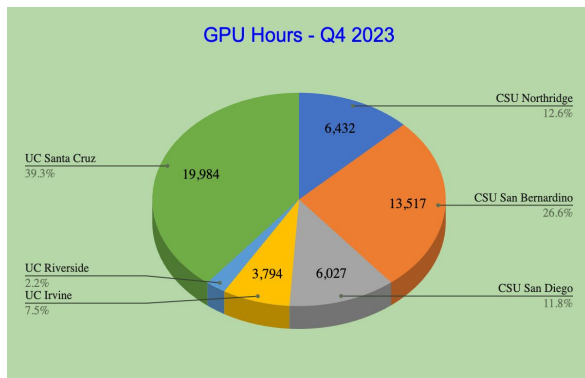
For vasp_std V5.4.4: mpirun -n <numprocs> vasp_std
For vasp_std V6.4.1: mpirun -n <numprocs> vasp6_std for Intel CPUs
For vasp_std V6.4.1: mpirun -n <numprocs> vasp6_std_amd for AMD CPUs
```



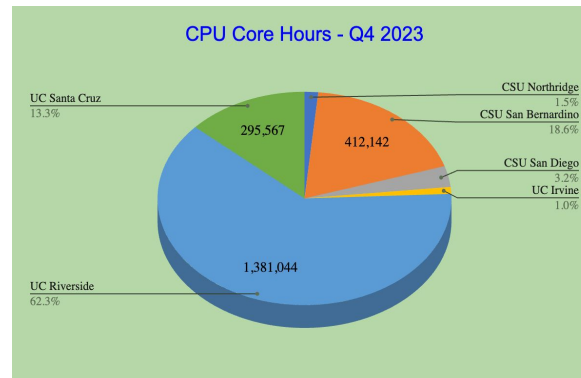
JupyterHub Dynamic Resource Allocation/Terminal Shell and NRP Resource Usage

CSUSB RESOURCE USAGE AMONG CALIFORNIA UNIVERSITIES

13.5k GPU hrs & 412k CPU hrs Q4 2023 (AWS Estimate of \$50k-60k)



50,893 GPU Hrs

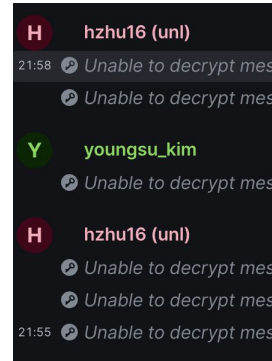
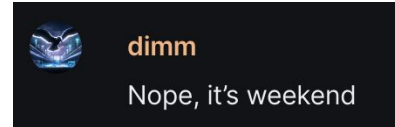


2,215,436 CPU Hrs

INTERMISSION

Thank the NRP team and special thanks to

- < Tom DeFanti, Larry Smarr
- < Dima, Huijun, Ashton, Mahidhar



How Jupyter Notebooks are Provided

Jupyter approach, by far, is the most efficient and scalable way so that everyone can access HPC powers at their fingertips.

- **Jupyterhub for CSUSB's members:** <https://csusb-jupyter.nrp-nautilus.io/>
 - over 450 distinct people who logged onto CSUSB's JupyterHub
 - Available to all CSUSB members, students, and other collaborative universities.
 - Leverage NRP's resources to deploy research computing packages.
 - Include customized software stacks.
 - Production readiness: 24x7 availability with dedicated tech support.
 - Some limitations to preserve resources.

○

How Jupyter Notebooks are Provided (Cont'd)

- **Jupyterhub dedicated for research:** <https://csusb-hpc.nrp-nautilus.io/>
 - For faculty / researchers
 - No limitation with very large HPC resources - high-end GPU.
 - Uninterruption - days, weeks until processing jobs are completed
 - Dedicated hardware and tech support

How Jupyter Notebooks are Provided (Cont'd)

- < **Multiple dedicated Jupyter Hubs and dedicated systems:**
 - Dedicated to research group / projects
 - Customized/dedicated software/stacks (VASP, blender, etc..)
 - Dedicated / reserved HPC resources / storages
 - Restricted access
 - Secured shared data.
 - PI administration

How Jupyter Notebooks are Provided (Cont'd)

< **Current dedicated Jupyter Hubs and dedicated systems:**

- <https://csusb-metashape.nrp-nautilus.io>: 3D modeling
- <https://csusb-vasp1.nrp-nautilus.io> Viena Ab initio Simulation package (VASP)
- <https://csusb-cousins-lab.nrp-nautilus.io>: VASP simulation
- <https://csusb-becerra.nrp-nautilus.io> AI/ML project
- <https://csusb-biol-5050.nrp-nautilus.io>: Biology course
- <https://csusb-cse-salloum.nrp-nautilus.io> Summer Research
- <https://csusb-drhamoudahub.nrp-nautilus.io> Data Analytics
- <https://csusb-ratnasingam.nrp-nautilus.io> Data Analytics
- <https://csusb-zhang.nrp-nautilus.io> AI/ML project

How Jupyter Notebooks are Provided (Cont'd)



CSUSB JupyterHub ☁

- Accessible to anyone with a CoyoteID
- Each user is provided with 50 GB of dedicated storage, expandable upon request
- Resources include large RAM and storage and multiple CPUs and GPUs
- Pre-installed software includes Linux desktop, Python, Matlab, R, Scipy, Pyspark, Tensorflow, a data science package, and SageMath
- Other software can be installed upon request
- Can be used for research and classes

CSUSB JupyterHub for faculty research ☁

- Dedicated to faculty research
- Contact [Youngsu Kim](#) or [Dung Vu](#) to access this server

Server Options

[Advanced Options](#)

Image

<input type="radio"/>	Stack Minimal
<input type="radio"/>	Stack Datascience
<input type="radio"/>	Stack R-Studio, Vs-code for Dr. Becerra's class
<input type="radio"/>	Stack Desktop Apps - VS Code
<input type="radio"/>	Stack Desktop Apps - Pgadmin4
<input type="radio"/>	Stack Desktop Apps - Blender
<input type="radio"/>	Stack PySpark
<input type="radio"/>	Stack PyTorch2
<input type="radio"/>	Stack R-Studio
<input type="radio"/>	Stack R-Studio for BIOL-5050
<input type="radio"/>	Stack SageMath

A Typical JupyterLab

The screenshot displays a web browser window with the URL `https://csusb-jupyter.nrp-nautilus.io/user/dvu@csusb.edu/lab`. The browser's address bar and tabs are visible at the top. Below the browser, the JupyterLab interface is shown. On the left side, there is a file browser panel with a search bar labeled "Filter files by name" and a table of files and folders. The table has columns for "Name" and "Last Modified".

Name	Last Modified
ciml-su...	9 months ago
Desktop	13 hours ago
Docume...	4 months ago
Downloa...	a year ago
dvu-ciml...	5 months ago
matLab	a year ago
Music	a year ago
Pictures	5 months ago
Public	a year ago
Python	a year ago
R	a year ago
scratch-...	6 minutes ago
shared	a minute ago
Sync	10 months ago
Templates	a year ago
tensorfl...	4 months ago
Videos	5 months ago
AnyLogi...	10 months ago
asset-de...	6 months ago
ball-in-g...	6 months ago

On the right side of the interface, there is a "Launcher" area with three sections:

- Notebook**: Contains four icons for "Python 3 (ipykernel)", "R", "RStudio [?]", and "VS Code [?]"
- Console**: Contains two icons for "Python 3 (ipykernel)" and "R"
- Other**: Contains six icons for "Terminal", "Text File", "Markdown File", "Python File", "R File", and "Show Contextual Help"

A Typical HPC Desktop

The screenshot displays a web browser window with the URL `https://csusb-hpc.nrp-nautilus.io/user/dvu@csusb.edu/desktop/`. The browser's address bar shows navigation icons, a star for bookmarks, and a user profile icon. Below the address bar, there are several tabs: "Your Policy", "Kindle", "oauthenticator.cil...", "ACCESS-CI Home...", "Copilot", "MS SOP & Person...", and "Reshaping layers". The main content area of the browser shows the pgAdmin 4 interface, which is connected to a Jupyter environment. The pgAdmin 4 interface includes a sidebar with a file explorer, a main content area with a "Welcome" message, and a "Getting Started" section with links to documentation, website, planet, and community support. The desktop environment shows a taskbar with icons for "Trash", "File System", "Home", "shared", "RESET...", "DESKT...", "pgAd...", and "README".

Connected to jupyter-dvu-40csusb-2edu:1 ()

pgAdmin 4

Object Explorer | Servers (6)

- postgresql-Ben
- postgresql-com-admin
- postgresql-com-joe
- postgresql-com-test
- postgresql-course-admin
- postgresql-course-test

Dashboard | Properties | SQL | Statistics | Dependencies | Dependents | Processes

Welcome

pgAdmin

Management Tools for PostgreSQL

Feature rich | Maximises PostgreSQL | Open Source

pgAdmin is an Open Source administration and management tool for the PostgreSQL database. It includes a graphical administration interface, an SQL query tool, a procedural code debugger and much more. The tool is designed to answer the needs of developers, DBAs and system administrators alike.

Quick Links

- Add New Server
- Configure pgAdmin

Getting Started

- PostgreSQL Documentation
- pgAdmin Website
- Planet PostgreSQL
- Community Support

This high performance computing system at CSUSB is supported by National Research Platform

NRP NATIONAL RESEARCH PLATFORM

Monitoring Running Pods

```
+ kubectl get pods -n prp-dvu-csusb -o wide
NAME                                READY   STATUS    RESTARTS   AGE   IP              NODE                                NOMINATED NODE   READINESS GATES
csusb-metashape-bc54586c-jcv4r     1/1    Running   0           6d2h  10.244.32.252  ry-gpu-14.sdsc.optiputer.net      <none>           <none>
+ kubectl get pod -n csusb-hpc -o wide
NAME                                READY   STATUS    RESTARTS   AGE   IP              NODE                                NOMINATED NODE   READINESS GATES
hub-5dfbd58c4b-rr9f8               1/1    Running   0           5d18h  10.244.243.174  gpn-fiona-mizzou-8.rnet.missouri.edu  <none>           <none>
jupyter-aswin-2enalluri-40csusb-2eedu  1/1    Running   0           5d17h  10.244.16.234   ry-gpu-13.sdsc.optiputer.net        <none>           <none>
jupyter-david-2evargasmonroy0554-40coyote-2ecsusb-2eedu  1/1    Running   0           4d9h   10.244.91.8     gpn-fiona-mizzou-6.rnet.missouri.edu  <none>           <none>
jupyter-suthakaran-2eratnasingam-40csusb-2eedu  1/1    Running   0           4d15h  10.244.133.177  gpn-fiona-mizzou-7.rnet.missouri.edu  <none>           <none>
postgres-ben-749fc57dd8-dfz8z      1/1    Running   1 (39d ago)  39d   10.244.158.241  hcc-nrp-shor-c6025.unl.edu          <none>           <none>
proxy-7f9d5644c9-x752b             1/1    Running   0           11d    10.244.243.148  gpn-fiona-mizzou-8.rnet.missouri.edu  <none>           <none>
syncthing-csusb-5956d44fbf-rx5jb    0/1    Pending   0           8d     <none>          <none>
+ kubectl get pod -n csusb-cousins-lab -o wide
NAME                                READY   STATUS    RESTARTS   AGE   IP              NODE                                NOMINATED NODE   READINESS GATES
hub-6b769d468-vkz4t                1/1    Running   1 (6d14h ago)  12d   10.244.237.198  suncave-12                          <none>           <none>
jupyter-kcousins-40csusb-2eedu      1/1    Running   0           17h   10.244.57.67    node-2-6.sdsc.optiputer.net         <none>           <none>
proxy-7c944fb594-4dbdp             1/1    Running   0           25d   10.244.19.31    fiona.nwsc.ucar.edu                 <none>           <none>
+ kubectl get pod -n csusb-mpi -o wide
NAME                                READY   STATUS    RESTARTS   AGE   IP              NODE                                NOMI
hub-669d7f4546-mkvw8               1/1    Running   0           4d5h   10.244.119.102  suncave-5                          <non
jupyter-david-2eilie2542-40coyote-2ecsusb-2eedu  1/1    Running   0           7d12h  10.244.241.248  ry-gpu-12.sdsc.optiputer.net        <non
jupyter-reymundo-2ealatorre8223-40coyote-2ecsusb-2eedu  1/1    Running   0           10d    10.244.50.221   rci-nrp-cpu-04.sdsu.edu             <non
proxy-7cf448fc6c-d5hhn             1/1    Running   0           11d    10.244.243.162  gpn-fiona-mizzou-8.rnet.missouri.edu <non
+ kubectl get pod -n csusb-khan -o wide
NAME                                READY   STATUS    RESTARTS   AGE   IP              NODE                                NOMINATED
hub-6485f8f697-gzmw8               1/1    Running   0           4d13h  10.244.56.115   node-2-11.sdsc.optiputer.net        <none>
jupyter-nathan-2ekelly0642-40coyote-2ecsusb-2eedu  1/1    Running   0           35h   10.244.26.101   ry-gpu-01.sdsc.optiputer.net        <none>
proxy-5c5944d7f9-5r89q             1/1    Running   0           14d    10.244.142.101  gpn-fiona-mizzou-9.rnet.missouri.edu <none>
(base) 000065181@TTS-TSFT-65681 ~ % █
```

Current AI/ML - Data Science Courses

1. CSE 5160 Machine Learning
2. IST 2510 Big Data Analytics
3. BIOL 5050 - Biostatistics and Experimental Design
4. IST 6110 - Foundations of Analytics and Big Data
5. IST 6620 - Business Analytics and Decision-Making
6. MATH 3465 - Computational Statistics

Current AI/ML Projects

There are 14 ongoing AI / ML projects

1. **Dr. Becerra:**

- Sleep Apnea

2. **Dr. Ronald Salloum**

- Cloud Removal from Satellite Imagery, Dr. Ronald Salloum

3. **Dr. Yan Zhan**

- Brain Tumor Classification with Deep Learning
- Hybrid Recommendation with Machine Learning
- Public Opinion Sentiment Analysis
- Medical Notes Labelling with Machine Learning
- Drug-Drug Interaction Prediction Based on Drug Feature Extraction and Drug Similarity

Current AI/ML Projects


4. Dr. Bilal Khan

- Automated identification of sheep activity via hybrid deep learning and computer vision approaches
- Real-Time Gun Detection in Video Streams using YOLOv8
- A Graph Attention Network Based Approach for Interpretable and Domain-aware Modeling of a Water Treatment System
- Exploring Wearable Interactive Technologies for Understanding and Assessing Autism Spectrum Disorder through Machine Learning Analysis of Communication and Social Interaction

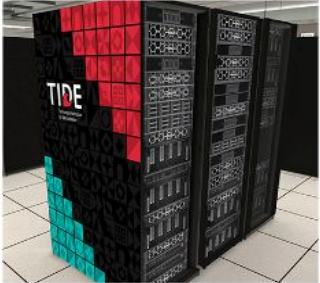
5. Dr. Jennifer Jin




- Personalized Health Assistant with Reinforcement Learning
- GPT-Empowered Personalized eLearning System for Programming Languages
- Classification of Remote Sensing Image data Using RSSCN-7 dataset


Contributions To NRP's Infrastructure

Hardware Details

Node Type	Qty.	Details
GPU	17	Dell PowerEdge R760XA (2x) Intel Xeon Silver 4410Y 2G CPU, 12C/24T (4x) Nvidia L40 GPU, 48 GB RAM 512 GB System RAM
GPU Advanced	1	Dell PowerEdge R750XA (2x) Intel Xeon Gold 6338 2G CPU, 32C/64T (4x) Nvidia A100 GPU, 80 GB RAM 512 GB System RAM
CPU	6	Dell PowerEdge R760 (2x) Intel Xeon Gold 6430 2.1G CPU, 32C/64T 768 GB System RAM
Storage	3	Dell PowerEdge R760 (2x) Intel Xeon Gold 6442Y 2.6G CPU, 24C/48T 256 GB System RAM 240 TB RAW Capacity



 616 CPU Cores  73 GPUs  14.592 TB RAM

U.S. National Science Foundation National Science Foundation, Campus Cyberinfrastructure, Regional Computing, Award 2346701

<https://tide.sdsu.edu/>

Publications

- < Kimberley Cousins, “Finding new function among known organic and organometallic crystalline materials” accepted for presentation at CINF and SciMix, American Chemical Society National Meeting, New Orleans, LA, March 17-21, 2024.
- < Sivaprasad Ghanta, J. Pham, et al, Atomic site preference, electronic structures, and magnetic properties of γ -brass type pseudo-binary $\text{Mn}_2\text{Zn}_{11}$ – $\text{Ni}_2\text{Zn}_{11}$ at high Mn-contents, Journal of Alloys and Compounds
- < Kylee Young, J. Pham, Computation-Guided Synthesis of Alkali–Transition-Metal–Halides. CRESTII Summer 2022 Research Poster.
- < Jaiung Jun, Youngsu Kim, and Matthew Pisano, On Picard groups and Jacobians of directed graphs, arxiv:2302.10327.
- < Dr. K. Liszka, Wadi el-Hudi Expedition: 3D modeling and Publications
<https://wadielhudi.com/3d-modeling-at-wadi-el-hudi/>
<https://wadielhudi.com/publications/>

Future Plan

- < With access to rich HPC resources, especially with the recent \$1M NSF funded CSU-TIDE Cyberinfrastructure, the following are CSUSB's future endeavors
 - Promote HPC awareness in faculty and expand HPC support to research for all academic domains.
 - Expand support for HPC-related courses, and growing research groups that involve more student participation
 - Collaborate with CSE faculty, SDSC, NRP to provide AI/ML support: As AI/ML has been integrating with all research aspects, they are indispensable tools for researchers for even the most complex research questions.
 - Expand collaborations with CSU sisters to share HPC services.

Acknowledgements

- < NRP has not only provided computing resources, hands-on expertises, but also dedicated technical support and solutions
- < It is a model to advance HPC programs, especially, for MSI who lack cyber infrastructure and HPC expertise
- < CSUSB is able to provide research computing capability to its faculty, students as if we were a UC. Thanks NPR, especially
 - Dr. Smarr, Dr. Defanti, Mr. Graham, Dr. Mishin
- < [CENIC - Innovation Award](#):



CSUSB

WE DEFINE THE *Future*

Monitoring Running Pods

```
+ kubectl get pods -n prp-dvu-csusb -o wide
NAME                READY   STATUS    RESTARTS   AGE   IP              NO
csusb-metashape-bc54586c-jcv4r  1/1    Running   0           6d2h  10.244.32.252  ry
+ kubectl get pod -n csusb-hpc -o wide
NAME                READY   STATUS    RESTARTS
hub-5dfbd58c4b-rr9f8  1/1    Running   0
jupyter-aswin-2enalluri-40csusb-2eedu  1/1    Running   0
jupyter-david-2evargasmonroy0554-40coyote-2ecsusb-2eedu  1/1    Running   0
jupyter-suthakaran-2eratnasingam-40csusb-2eedu  1/1    Running   0
postgres-ben-749fc57dd8-dfz8z  1/1    Running   1 (39d ago)
proxy-7f9d5644c9-x752b  1/1    Running   0
syncthing-csusb-5956d44fbf-rx5jb  0/1    Pending   0
+ kubectl get pod -n csusb-cousins-lab -o wide
NAME                READY   STATUS    RESTARTS   AGE   IP              NO
hub-6b769d468-vkz4t  1/1    Running   1 (6d14h ago)  12d  10.244.237.198
jupyter-kcousins-40csusb-2eedu  1/1    Running   0           17h  10.244.57.67
proxy-7c944fb594-4dbdp  1/1    Running   0           25d  10.244.19.31
+ kubectl get pod -n csusb-mpi -o wide
NAME                READY   STATUS    RESTARTS   A
hub-669d7f4546-mkvw8  1/1    Running   0           4
jupyter-david-2eilie2542-40coyote-2ecsusb-2eedu  1/1    Running   0           7
jupyter-reymundo-2ealatorre8223-40coyote-2ecsusb-2eedu  1/1    Running   0           1
proxy-7cf448fc6c-d5hnn  1/1    Running   0           1
+ kubectl get pod -n csusb-khan -o wide
NAME                READY   STATUS    RESTARTS   AGE   IP              NO
hub-6485f8f697-gzwmwt  1/1    Running   0           4d13  10.244.26.101  ry-gpu-01.sdsc.optiputer.net
jupyter-nathan-2ekeilly0642-40coyote-2ecsusb-2eedu  1/1    Running   0           35h  10.244.142.101  gpn-fiona-mizzou-9.rnet.missouri.edu
proxy-5c5944d7f9-5r89q  1/1    Running   0           14d  <none>
(base) 000065181@ITS-TSFT-65681 ~ %
```

Processing in progress... ✕

Matching points...

97% done, 41 days 13:50:42 elapsed

Overall progress:

▼ Details

max work group size 1024
max work item sizes [1024, 1024, 64]
6424442 matches found in 51.0722 sec
matches combined in 0.852476 sec
filtered 621665 out of 3392497 matches (18.3247%)
in 0.948266 sec

Minimize Pause Background Cancel

How HPC Resources Are Provided

- < We provide full HPC assistance
 - Promote HPC resources with hardware and software availability
 - Approach faculty to learn about HPC needs and offer HPC support
 - Deploy software and build scalable and optimized HPC systems
 - Ensure resource availability, reliability, and stability
 - Collaborate with NRP tech to provide solutions
 - Update users with advanced and cutting-edge HPC features
 - We take responsibility to ensure faculty successfully complete their research – giving up is not a solution