

# HIGH PERFORMANCE RESEARCH COMPUTING

## Fundamentals of R Programming

HPRC Training

4 October 2024



High Performance  
Research Computing  
DIVISION OF RESEARCH



# Course Outline

1. Accessing Grace
2. Launching Tutorials OnDemand
3. Arithmetic Operators
4. Data Types and Variables
5. Built-in Functions
6. Vectors
7. Matrices
8. Data Frames

# Accessing the HPRC Grace Portal

The screenshot shows the HPRC website interface. At the top left is the Texas A&M logo. To its right is the text "TEXAS A&M HIGH PERFORMANCE RESEARCH COMPUTING". On the far right of the top bar are social media icons for Twitter, YouTube, and WordPress, along with a search icon. Below this is a dark red navigation bar with the following links: Home, User Services, Resources, Research, Policies, Events, Training, About, and Portal. The "Portal" link is highlighted with a red box. A dropdown menu is open from the "Portal" link, listing the following options: Terra Portal, Grace Portal (highlighted with a red box), FASTER Portal, FASTER Portal (ACCESS), ACES Portal (ACCESS), and Launch Portal (ACCESS). Below the navigation bar is a large banner image of server racks. On the left side of the page, there is a "Quick Links" section with a list of links: New User Information, Accounts, Apply for Accounts, Manage Accounts, User Consulting, Training, Knowledge Base, Software, and FAQ. Below this is a "User Guides" section with links for ACES, FASTER, Grace, and Terra. The main content area features a scientific diagram showing a protein structure, a plasmid DNA molecule, a micrograph of a cell, and a diagram of a cell with a nucleus and organelles.

HPRC webpage: [hprc.tamu.edu](http://hprc.tamu.edu)

# Launching Tutorials OnDemand on Grace

The screenshot shows the TAMU HPRC OnDemand (Grace) web interface. The top navigation bar includes 'Apps', 'Files', 'Jobs', 'Clusters', 'Interactive Apps', 'Dashboard', and 'My Interactive Sessions'. The 'Interactive Apps' menu is open, displaying a list of applications categorized by domain: BIO, GUI, and Imaging. The 'Imaging' category is expanded, showing a list of applications including ChimeraX, Diffusion Toolkit & TrackVis, FSL, Fiji, ImageJ, VMD, cisTEM, CryoSPARC 3.3.1, CryoSPARC 4, and CryoSPARC 4.5.1. At the bottom of this list, 'Tutorials OnDemand' is highlighted with a red box. A red arrow points from a text box to the bottom of the 'Interactive Apps' menu, and another red arrow points from the text box to the 'Tutorials OnDemand' option.

TAMU HPRC OnDemand (Grace) Apps Files Jobs Clusters **Interactive Apps** Dashboard My Interactive Sessions </> Develop Help Logged in as wbrashear Log Out

OnDemand provides an integrated,   
our HPC resources.

**Pinned Apps** A featured sub

Drona Joblisting  
System Installed App

Grace da  
System Inst

Jupyter Notebook  
System Installed App

**Message of the Day**

**IMPORTANT POLICY INFORMATION**

- Unauthorized use of HPRC resources is prohibited and subject to criminal prosecution.
- Use of HPRC resources in violation of United States export control laws and regulations is prohibited. Current HPRC staff members are US citizens and legal residents.
- Sharing HPRC account and password

Scroll down to the bottom of the drop-down menu

Imaging

- ChimeraX
- Diffusion Toolkit & TrackVis
- FSL
- Fiji
- ImageJ
- VMD
- cisTEM
- CryoSPARC 3.3.1

Servers

- Jupyter Notebook
- JupyterLab
- RStudio R 4.1.0+
- RStudio R 4.0.3, 3.6.3
- Spark-Jupyter Notebook
- TensorBoard
- Tutorials OnDemand**

powered by **OnDemand**

## Tutorials OnDemand

This app will launch Tutorials OnDemand on the [Grace cluster](#).

What tutorial would you like to access?

Fundamentals of R

Select "Fundamentals of R"

Number of hours (max 10)

8

Set number of hours to 8

Email

This field is optional.

Launch

Click "Launch" once the correct parameters have been selected

\* The Tutorials OnDemand session data for this session can be accessed under the [data root directory](#).

Session was successfully created. ✕

[Home](#) / [My Interactive Sessions](#)

### Interactive Apps

BIO

Beauti

CRISPR-Local

Gap5

IGV

JBrowse

Mauve

RNAlysis

Structure

XtalOpt

### Tutorials OnDemand (11562830)

1 node | 2 cores | Running

Host: [>\\_c310](#)

✕ Delete

Created at: 2024-10-01 09:29:00 CDT

Time Remaining: 7 hours and 54 minutes

Session ID: [b50faf7f-97ea-49c0-bd64-6e58c79201d1](#)

[Connect to Tutorials OnDemand: Fundamentals of R](#)

Click this button when it says  
“Connect to Tutorials  
OnDemand: Fundamentals of  
R” (this will take a minute)

# Transition to Workbook

## Fundamentals of R

- Mathematics Operations
- Data types
- Variables
- Built-in functions
- Vectors
- Flow control
- Matrices
- Data Frames and Tibbles
- dplyr
- Importing and Exporting Data
- Regression
- Principal Component Analysis
- Data Visualization with ggplot2

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Start Over

## Mathematics Operations

In it's simplest form, R can be used as a calculator (although it can do so much more!). Let's get started in R by doing some basic arithmetic!

### Arithmetic Operators

- Addition: `+`
- Subtraction: `-`
- Multiplication: `*`
- Division: `/`
- Exponentiation: `^`
- Modulo: `%%`

Use the correct operators to complete the equations in the code chunks below.

```
R Code  
```

```
1 # Add 12 and 3  
2  
3
```

```
R Code  
```

```
1 # Subtract 7 from 11  
2  
3
```

```
R Code  
```

```
1 # Multiply 27 by 9  
2  
3
```

```
R Code  
```

```
1 # Divide 46 by 8  
2  
3
```



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<https://hprc.tamu.edu>

HPRC Helpdesk:

help@hprc.tamu.edu

Phone: 979-845-0219

*Take our short course survey!*



HPRC Survey

[https://u.tamu.edu/hprc\\_shortcourse\\_survey](https://u.tamu.edu/hprc_shortcourse_survey)

Help us help you. Please include details in your request for support, such as, Cluster (Faster, Grace, ACES, Launch), NetID (UserID), Job information (Job id(s), Location of your jobfile, input/output files, Application, Module(s) loaded, Error messages, etc), and Steps you have taken, so we can reproduce the problem.

