National Science Foundation (NSF) funded NRT:

Computing and Data Science Training for <u>Materials Innovation</u>, <u>Discovery</u>, & <u>Analytics</u> (MIDAS)

NRT Director: Prof. Arthi Jayaraman

NRT Program Coordinator: Ms. Jennifer Johnston

https://sites.udel.edu/midas-nrt



NRT Director & NRT Program Coordinator

NRT Director Prof. Arthi Jayaraman PI, NSF-NRT grant



NRT Program Coordinator Jennifer Johnston



Interdisciplinary traineeship for doctoral students

- For admitted 1st year doctoral students in UD Chemical Engineering (CBE), UD Materials Science & Engineering (MSEG), UD Computer Information Sciences (CIS), UD Electrical &Computing Engineering (ECE) and DSU Chemistry (CHEM)
- Research themes combine to different extents high-performance computing (HPC),
 data science (DS), and soft materials (mostly polymers)
- NRT traineeship fits in the timeline of the individual UD graduate programs

UD – University of Delaware DSU – Delaware State University

Interdisciplinary traineeship for doctoral students

- **NRT traineeship augments the experiences** that PhD students have beyond what they experience in their own graduate programs.
 - Funded NRT trainees get faculty co-advisors (assigned by the NRT) with expertise complementary to the expertise of their primary faculty advisor
 - NRT trainees participate in NRT industry internship (mandatory for funded trainees) or teaching certificate program
 - All NRT trainees participate in regular community hours that include networking events, technical talks by experts, & professional skills workshops
 - All NRT trainees plan & execute **community/public outreach** activities

NRT Trainees – 1st cohort (from Fall 2022)



NRT traineeship timeline (Year 1 of NRT program)

- Fall Before Year 1
 - NRT trainees selected in mid-December
- Year 1 Winter & Spring
 - NRT trainees continue to take their PhD core & elective courses in their respective departments
 - NRT trainees start their **research** (same timeline as other non-NRT students in your departments)
 - NRT trainees attend NRT community hours (workshops, talks, RCR training)

Year 1 Summer

 Community outreach: All NRT trainees pair up to plan and create activities for outreach to the public/local community – learn to effectively communicate their research work with public and nonscientist audience

Year 1 Fall

• By the end of Year 1 Fall, the NRT trainees should have completed at least **one technical elective in the primary discipline** and **one technical elective in secondary discipline**

NRT traineeship timeline (Year 2 of NRT program)

Year 2 Winter

• NRT trainees continue to do their **research** and **attend one NRT community event**

Year 2 Spring

- All NRT trainees enroll in a mandatory NRT 'hackathon-style' interdisciplinary course "Computing and data science for soft materials innovation"
 - Interdisciplinary group of graduate students who work in teams of 3-4 with each team tackling one project submitted by industry/ national lab
 - Instructors teach molecular modeling and simulation, high performance computing, and machine learning with emphasis towards application of these tools to soft materials problems.
 - Students apply these computational tools to solve the industry or national lab problem throughout the semester
 - Students also learn and practice collaborative teamwork, and oral + written communications training regularly; professional skills in interdisciplinary work environment



In Spring 2022

7 Graduate students from computer information sciences & electrical and computer engineering

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8 Graduate students in chemical engineering, materials science and engineering, chemistry, & physics

Co-instructed in Spring 2022 by Arthi Jayaraman (Chem Eng., Mat Sci & Eng.) Sunita Chandrasekaran (Comp. Sci)



(Spring 2022 companies who worked with us)



Open access - FINAL REPORTS from Spring 2022 on our NRT website



NRT traineeship timeline (Year 2 of NRT program continued)

Year 2 Summer

• For those interested in industry or national lab

Industry/National Lab Internship

For the entire summer, NRT trainees gain on-site experience with one of our partner companies who combine data science and computing for solving materials problems.

Mandatory for NRT-funded UD & DSU trainees interested in industry/national lab career

For those interested in academia

2-part Teaching Certificate Program

Part 1 Effective teaching workshop by NRT core faculty in Y2 summer
Part 2 Teaching fellowship in core/elective/NRT course in Y2 Fall or Y3 Spring semester
Open to all NRT trainees and other students enrolled in UD & DSU

Year 2 Fall

• Funded NRT trainees will enroll in 1-credit NRT Capstone design course where they prepare a plan for how they combine computing, data science, and soft materials in their thesis

NRT community activities – throughout the traineeship

Fall & Spring NRT Community Hours

Professional workshops

- RCR (Responsible Conduct in Research)
- Diversity, Equity, Inclusion
- & Respect (DEIR)
- Ethics in Data Science
- Effective Communications

Technical talks

- Speakers from Industry, Academia & National Lab
- NRT Trainees' poster presentations

NRT Community Gathering



How and when to apply to the NRT?

- Go to <u>https://sites.udel.edu/midas-nrt</u> and click on "How to apply" in the menu
 - Has all the relevant information who can apply, how to apply, selection process
- A google form + information on what is needed before you fill the google form
 - This year's deadline November 30th 2022, 5pm
- Selection process will take place December 1 December 15
 - Alignment in thesis topics with NRT research themes, CV, personal statement
 - Short interview (virtual/in person) of finalists before final list of trainees are selected

NRT decision letters

- Final decision that every applicant will get will inform them if they have been
 - Selected as a "NRT Trainee funded by NRT grant" for 2 years and then by their primary advisor
 - Selected as "NRT Trainee, not funded by NRT grant" (funded by primary advisor through out)
 - Not selected for NRT program

Trainee funded by NRT grant

- 3-4 (UD) + 1-2 (DSU) domestic students (US citizen, green card holder)
 - NRT grant provides 2 years of stipend + tuition covered (Jan AY1 through December AY3) travel support (~\$500 per trainee) once;

OR 1 International student

- Will receive 1 semester of tuition + stipend from COE + travel support (\$500 once)s
- Must have an assigned primary advisor who will support the trainee outside of any NRT/COE funding
- Secondary advisor will be assigned by NRT team
 - will bring in complementary expertise to that of primary advisor and work with the trainee and primary advisor in IDTP preparation, mentoring, & research direction
- Trainee is expected to do an internship in industry OR teaching certificate program

UD – University of Delaware DSU – Delaware State University

Trainee not funded by NRT grant

- ~4-5 International or domestic students who are interested in participating in this program
 - Trainees should have other sources of funding (e.g., primary advisor's grant supports them or the trainee's department TA-ship, etc.)
 - Trainees' primary advisor or source of funding should approve the trainee's participation in the training elements at time of selection
- Trainee commits to (selected) technical and professional training elements (designed to fit well within graduate program timeline)
- NRT grant/COE funds will provide travel support (\$500 per trainee) once
- Access to all professional workshops (including teaching certificate program), other networking opportunities
- Industry internships will be possible only if positions available

Frequently asked questions

- I am an MS degree student at UD. Is the NRT program only for students in the PhD program?
 - This NRT program is designed for PhD students in their 1st year.
- Will I have to select a secondary advisor before applying?
 - No, those who are funded by the NRT program will be assigned secondary advisor by the NRT program; goal to assign someone with expertise different but complementary to primary advisor expertise so the trainee receives combined computing/data science & soft materials advising
 - Unfunded NRT trainees will not get an assigned co-advisor.
- Do I have to take more courses than expected from my grad program?
 - You only do as many electives as your grad program expects. All that the NRT program expects you
 to do is select those electives with a purpose to bring interdisciplinarity in your training
 - 1 elective of your choice on *computing* (e.g., molecular modeling & simulations, Intro or advanced machine learning courses, GPU computing course),
 - 1 elective of your choice on *soft materials* (e.g., polymers elective for CBE/MSEG students or molecular modeling for soft materials for CS students)
 - Mandatory Spring Y2 NRT 'hackathon-style' course "Computing and data science for soft materials innovation"
 - Funded trainees also take in Year 2 Fall a 1-credit capstone design course (note: NRT is paying your tuition so it should not be a worry for your advisors that you are taking this class)

Frequently asked questions

• I am an international student. Am I allowed to participate in this NRT program? Can I apply?

- Yes, an international student can be part of the NRT program. You cannot receive any financial support from the NSF NRT grant (NSF rules).
- We have an additional pot of money from college of engineering to support international student NRT trainee travel (for unfunded NRT trainees) or 1 semester of stipend & tuition (for funded NRT trainee who is an international student)

• Will I get a special degree or certificate?

- Your degree will be the same as what you would get from your UD grad program
- We are working on trying to create a certificate program so the NRT trainees (funded or unfunded) can get an additional certificate (not confirmed yet)
- Who supports me financially after my NRT funding runs out (a question from NRT funded trainees)?
 - Your primary advisor (research support) or your department (TA support)