

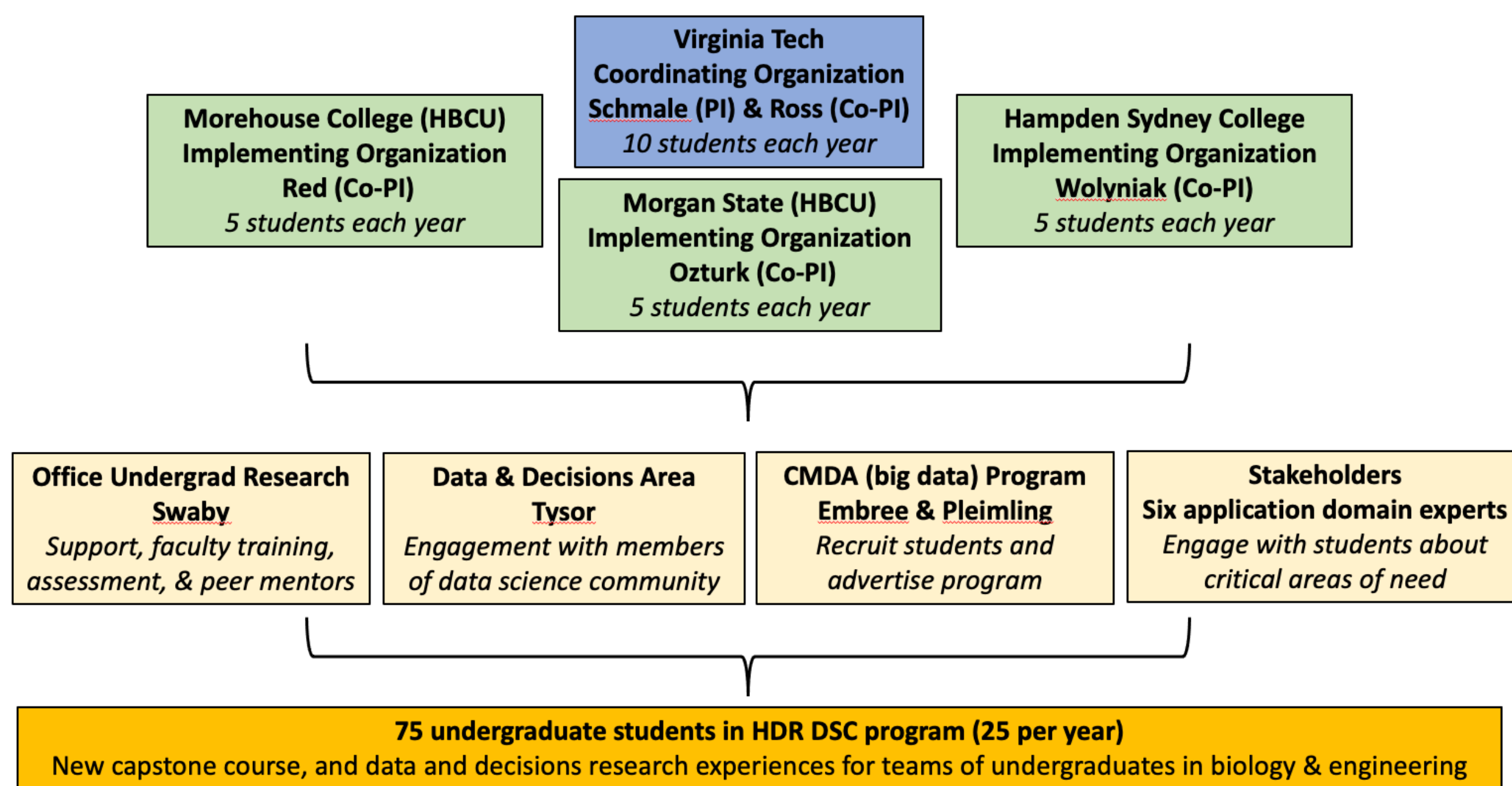
# Engaging Undergraduates in Data and Decisions Research at the Engineering/Biology Interface

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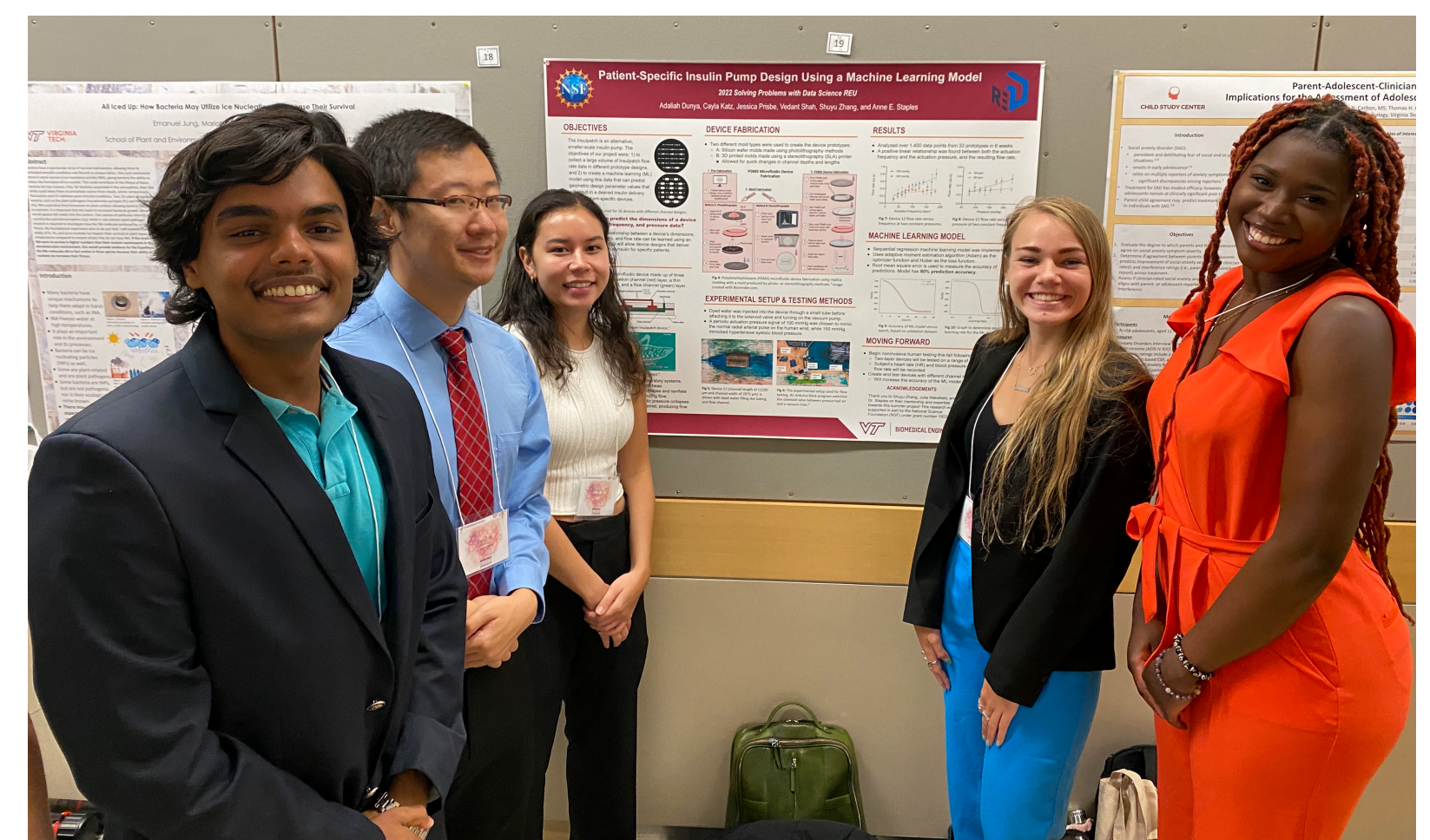
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The ultimate goal of our program is to provide interdisciplinary education and research opportunities in data and decisions science for undergraduate students who are experts in a core discipline of engineering or biology, but who are also proficient in the alternate discipline. We are training students with complementary disciplinary expertise that can address problems at the engineering/biology interface, and show them, via stimulating grand challenge problems, the utility of data science techniques, thereby promoting data literacy and providing basic training in data science to key members of the science and engineering workforce. We have launched a unique HDR DSC program at Virginia Tech (coordinating organization), Morehouse College (HBCU for men, Georgia, implementing organization), Morgan State (HBCU for men and women, Maryland, implementing organization), and Hampden-Sydney College (all-male college, Virginia, implementing organization). A new collaborative, multi-university capstone course 'Solving Big Problems with Big Data' is being taught simultaneously at all four universities. Through this course, multi-university teams of students work together to identify relevant broad social, global, economic, cultural and technical needs and constraints, and determine the ways in which their complementary technical skills contribute to addressing complex data science grand challenges at the engineering/biology interface. In Fall, 2021, the project provided data science educational opportunities for 26 undergraduate students and one graduate student through the first course offering. Students were introduced to professionals in various sectors through 8 different stakeholder presentations, where they learned challenges of those sectors. In Summer, 2022, the project provided paid summer undergraduate data science research opportunities for 21 participants in 10 labs at Virginia Tech. This Fall, 2022, the project is providing educational opportunities for an additional 22 undergraduates that are enrolled in our undergraduate course for its second course offering.



Course Schedule	
Week	
1	Introductions, course objectives, expectations, and guidelines
2	How to work as part of teams
3	What is data science?
4	Collecting and storing data
5	Data visualization
6-8	Stakeholder presentations
9	Building a team: Stories from the front lines
10	Organizing your team research proposal
11	How to give effective research presentations
12	Project management
13-14	Presentations by teams on research proposals
15	Written research proposals due



Agriculture	Conservation	Search & Rescue	Water Quality	Transportation	Global Health
<b>Needs:</b> Data from weather stations to inform crop management decisions	<b>Needs:</b> Data from chemical sensors to guide emissions policy decisions	<b>Needs:</b> Data from robots to assist in rescue decisions	<b>Needs:</b> Data from water reservoir to make decisions on safety of water	<b>Needs:</b> Data from road to make decisions on road icing treatments	<b>Needs:</b> Data on spread of infectious disease to make vaccine decisions
<b>Sensor assets:</b> Drone-based weather stations	<b>Sensor assets:</b> Portable CO2 sensors	<b>Sensor assets:</b> Remotely operat. vehicles, drones, manikins	<b>Sensor assets:</b> Unman. surface vehicle, water quality sensors	<b>Sensor assets:</b> VTTI Smart Road embedded with sensors	<b>Sensor assets:</b> Drone delivery of vaccines
<b>Computer assets:</b> Plant disease transport models; causation	<b>Computer assets:</b> Self-organizing maps and atmos. transport models	<b>Computer assets:</b> Automated image identification and risk models	<b>Computer assets:</b> Water transport & quality models	<b>Computer assets:</b> Icing models and risk models	<b>Computer assets:</b> Disease spread models; optimal delivery algorithm

This project was supported by NSF HDR DSC award #1922516 titled 'Engaging Undergraduates in Data and Decisions Research at the Engineering/Biology Interface'.

