

# INSuRE Information Security Research Education

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# INSuRE - Mission

- Provide students with research education and experience early in their academic careers and develop crucial skills to improve workforce readiness:
  - Acquaintance with research methods
  - Ability to design a path to understand/solve a problem
  - Ability to present the findings succinctly in written and oral form
  - Ability to work in teams
- Provide government agencies and national laboratories with critical resources:
  - Additional help in solving applied cybersecurity research problems of national interest
  - Source of strong students for recruitment
  - Opportunity to establish research collaborations in cybersecurity research between Problem Mentors (PMs) and faculty/student teams

# INSuRE – History and Growth

- Traditional INSuRE:
  - Academic institutions:
    - Started in 2012 with Purdue University as the first and only academic institution
    - Today, there are 27 CAE institutions participating across the country
  - Government agencies and national laboratories:
    - Started with NSA as the first and only government agency mentoring teams from Purdue University
    - Today, there are 17 government agencies and national laboratories proposing problems
- New INSuRE track introduced in Fall 2021:
  - INSuRE+C (C for Collaborative) aims at establishing research collaborations and producing substantial research results through longer and more dedicated collaborative efforts by research-active faculty and their (graduate) students
  - The traditional INSuRE track was renamed to INSuRE+E (E for Education)
  - To date: 2 teams (AY 21-22) and 4 teams (AY 22-23)

# INSuRE+E – Goal and Core Program Elements

- Provides research education to graduate and/or undergraduate students (3<sup>rd</sup> year and above) at CAE institutions
  - Broad range of proposed applied cybersecurity research problems that are of national interest
  - Especially attractive to smaller schools where research opportunities may not be readily available
- Some core program elements
  - Teams of students are formed by each institution's faculty in charge
  - Teams commit to work on the research problem for at least one semester (continuation into second semester possible with approval from the Problem Mentor (PM))
  - INSuRE course run locally, coordinated across all participating institutions with common meeting time and deliverables

# INSuRE+E - Administration and Milestones

- Problem solicitation: PMs from government agencies and labs are asked to submit problems (until a few days before the Open House)
- Publication of problems: On a rolling basis as submitted, on the INSuREHub
- Open house: 2<sup>nd</sup> Friday in August/January for Fall/Spring semesters
- Bid submission: Very early in the semester, each student team submits at least 3 bids on problems they wish to work on
- Project assignment: PMs review bids, based on which INSuRE Admins determine an assignment across all participating institution

# INSuRE+E - Administration and Milestones cont'd

- Start of research: immediately following project assignment; regular meetings between teams and PMs
- Project proposal: Student teams prepare and submit a research proposal under the guidance of the PM and their faculty
- Reporting and presentations: Written progress and final reports are mandatory; oral presentations are held at both midterm and end of the semester to all participating INSuRE students/faculty and PMs

# INSuRE+E – Current State

- AY 22-23
  - Number of participating students: 165
  - Number of participating CAE institutions: 8 (3 in both semesters)
  - Number of proposed problems: 44
  - Number of participating agencies and national labs: 8
- Fall 23
  - Number of participating students: 98
  - Number of participating CAE institutions: 12
  - Number of new institutions: 1
  - Number of institutions on waiting list for Spring 24: 10
  - Number of proposed problems: 31
  - Number of participating agencies and national labs: 5

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# INSuRE+C – Goal and Core Program Elements

- Provides a comprehensive infrastructure to establish research collaborations between government agencies/labs and research-active faculty members and their teams at CAE-R institutions
  - Affords graduate students with an opportunity to work on and gain an appreciation for applied research problems in cybersecurity that are of national interest
- Some core program elements
  - Research teams are comprised of one or more faculty members and 2-3 graduate students (preferably at PhD level)
  - All participating faculty members and students have to be US citizens or permanent residents
  - Teams commit to work on the research problem for a full academic year, with an option to continue into the summer

# INSuRE+C - Administration and Milestones

- Problem solicitation: PMs from government agencies and labs are asked to submit problems
- Publication of problems:
  - All problems proposed by PMs are gathered in an encrypted PDF file which is then sent to CAE-R PoCs together with the password
  - PoCs distribute the encrypted file to research active faculty within their institutions
- Open house:
  - Faculty members who wish to discuss their initial ideas with PMs submit a request through an RSVP form
  - Initial discussion sessions between faculty members and PMs are arranged either through Zoom or email communication

# INSuRE+C - Administration and Milestones cont'd

- Project proposals:
  - Content:
    - Approach to the problem
    - Timeline spanning the academic year
    - CVs of all faculty members and students on the project
    - Description of faculty member's expertise and how it can be applied to the project
    - Statement on how joint oversight of students can be accomplished if multiple institutions are involved
  - Process:
    - At most 2 proposals per faculty member can be submitted. Each faculty member can participate only in one research project.
    - Proposals are reviewed by PMs and are the basis for selecting teams
- Reporting and presentations:
  - Three oral progress reports: at the end of the Fall semester, midterm and end of Spring semester

# INSuRE+C - Continuation into Summer

- Teams who continue into the summer may request funding support
  - Faculty stipend of \$21,000
    - Summer support of each faculty from all sources, including INSuRE+C, cannot exceed 3 months' of effort
    - Faculty stipend will be equally divided among all faculty members on the project
  - Each student receives a stipend of \$5,000/month for up to three summer months
- PMs' reviews, together with the final progress reports, determine the award of summer funding
- Number of supported teams depends on availability of funds
- Publication to a peer-reviewed venue ready for submission is expected by the end of the summer

# Current State of INSuRE+C

- AY 21-22:
  - Number of participating CAE-R institutions: 2
  - Number of participating students: 4 (all PhD students)
  - Number of participating faculty members: 2
  - Number of publications: 2-4
- AY 22-23:
  - Number of participating CAE-R institutions: 4
  - Number of participating students: 11 (PhD and MS students)
  - Number of participating faculty members: 4
  - Number of publications: TBD
- AY 23-24:
  - Number of interested institutions: 7
  - Number of interested faculty members: 12

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# Challenges

- Recruiting and retaining PMs
  - Marketing INSuRE to other agencies
  - Difficulty in identifying Agency Coordinators (ACs) who are dedicated to the program
  - Large turn-over results in lack of PM availability
- For INSuRE+E, inclusion of new institutions needs to be controlled
  - Huge interest from CAE institutions vs.
  - Insufficient availability of problems and mentors
- For INSuRE+C, funding for summer support cannot always be depended on

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# The Path Ahead

- INSuRE will continue to
  - build research capabilities among the cybersecurity workforce
  - produce thinkers and problem solvers to tackle the most pressing and difficult challenges in cybersecurity
- Sustainability of the program in the long term may be questionable due to lack of ACs, PMs, and proposed problems
  - Can student-introduced problems be used as part of INSuRE+E?
  - Can faculty-introduced problems be used as part of INSuRE+C?
- Funding is needed to sustain research collaborations

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