Enriching Graduate Computer Science Curriculum via Holistic Cross-Cutting Courses
Santosh Pande and Polo Chau, College of Computing, Georgia Tech

Motivation and Trends
- Last two decades, Computing: tremendous growth in terms of diversity of areas; CoC, every nook corner covered
- Graduate courses still offered as siloed topics -- designed in early years of CS
- Curricular demands for research as well as practice demand holistic understanding across topical areas

Model of Cross Cutting Courses
- Cross cutting courses across 2 to 3 topical areas, with or without co-teaching
- Centered on learning objectives, promotes understanding much more than sum of the parts
- Home-works and Projects designed to promote cross-cutting experience
- Could involve top researchers -- industry

Case Study: Embedded Software Optimizations
- Late 1990's/early 2000's, major disruption: cell phones, PDAs
- Hardware- software stack had to be reinvented – major disruption
- Cambrian explosion, extinction
- Rapid evolution, very high diversity of computing platforms
- Pedagogic Challenge: How to keep the course moored into principles and foundations yet embrace diversity and plethora of embedded processors and new application?
- Solution: Drive learning objectives by generalizations and abstractions, learning must last well beyond current trends

Lessons learnt: Do's
- Define cross cutting learning objectives outcomes clearly and follow them rigidly
- Extend a topic through cross cutting projects-lots of experiential material outside classroom, ability to navigate!
- Develop the course by a single hand, then involve a co-instructor to co-teach
- Always remind students about the cross cutting theme objective throughout

Lessons learnt: Don'ts
- Do not try to amalgamate two existing classes
- Too many topics – recipe for disaster
- Too many co-instructors: two is a company, three is a crowd ☺
- This is not a place to get research done - student background/interests matter
- Mixing incoherent topics = lost students

Cross cutting course innovation initiative in CoC
- Within and across schools, attempt to bring faculty together, promote teaching and research collaborations
- Provide mentoring to junior faculty byproduct
- Bring state of the art in research centers to the classrooms, well beyond guest lectures

Sample Courses Proposed/Development
- Secure MPC with PL insights – by Kolesnikov
- Memory systems: a cross stack view – by Devescery
- Data Analytics using Deep Learning – by Arulraj
- Data Management and ML – by Chu
- Machine learning – a major cross cutting theme - TBD