



Fulbright Experience in Networks Lab

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Agenda of Visit

Designing a High Capacity Elastic Optical Network for Large Geography (USA and India) to Sustain Long Term Growth in Telecom Broadband Services.

- **Foster Research Collaboration on a Common Area of Interest**
 1. WP1: Develop an NLI based model over C+L bands scenario.
 2. WP2: Utilise the model to plan network upgrade.
 3. WP3: Develop strategies to reduce fragmentation under C+L bands scenario.
 4. WP4: Plan for efficient utilisation of C+L bands spectrum for disaster management and recovery.
- **Cognitive Enrichment through Cross-Cultural Activities**
 1. Learn about local culture with participation in various social groups and gatherings.
 2. Work in an heterogeneous cultural environment while valuing diverse thoughts to solve a larger problem.
 3. Participate in weekly meetings and group discussions to plan future steps of the work plan.
 4. Give presentations and talks on relevant optical broadband technologies.

Outcomes

- **WP1: Develop an NLI based model over C+L bands scenario.**
 1. Initial NLI modelling was achieved in IIT Delhi (accepted in October 2019).
 2. Making the model adaptable for utilisation of Gain Flattening Filter (GFF) was completed by March 2020.
 3. A techno-economic comparison of nC band and C+L bands scenario has been completed to show in which network size, a C+L bands scenario will be beneficial and paper writing is under progress for **ECOC 2020 conference**.
- **WP2: Utilise the model to plan network upgrade to C+L bands.**
 1. Mentored PhD student Mrs. Tanjila Ahmed towards her Ph.D. dissertation in the area of network upgrade strategy.
 2. Innovative spectrum utilisation-aware routing strategy was developed while considering a brownfield mixed-grid scenario with WDM and Flexgrid Islands. **(Published in JOCN)**.
 3. Further steps have been taken to develop batch-upgrade strategies for network link upgrade towards C+L bands. **(To be submitted to JOCN)**.
- **Additional WP: Develop Optical Pattern Matching (OPM) circuit.**
 1. Mentored Ms. Ying Tang towards her Ph.D. dissertation in the area of Photonic Firewall using OPM.
 2. Taught her the fundamentals of nonlinear interference to design optical logic gates.
 3. Designed new architectures using all optical logic gates while considering coherent modulation formats. **(To be submitted to IEEE/OSA Journal)**
- **Other Outcomes:**
 1. Enjoyed excellent interactions with faculty members and Fulbright scholars.
 2. Got exposed to new research areas through talks and seminars.
 3. Developed new friendships and expanded social interactions.

Summary

- **Following topics are open for investigation:**
 1. Topics on Defragmentations (WP3) and Disaster Management (WP4) are still open.
 2. Primarily because physical-layer model further evolved towards dynamic use of GFF and inclusion of S Band.
 3. Also a major disruption was due to COVID-19.
- **Learnings:**
 1. Learned about network planning.
 2. Improved teaching skills, while explaining new technologies to Ph.D. students (Tanjila Ahmed and Ying Tang)
 3. Gained exposure to a multicultural environment while interacting with Network Labs researchers and Fulbright scholars from various countries, consequently developing strong ties for future interdisciplinary collaborations.
- **Contributions:**
 1. Students have learned about the rising challenges in the physical layer while designing the next generation of broadband optical networks.
 2. The vision that in future, optimum solutions will involve a harmonious interplay between the network and physical layers has been further corroborated.
 3. Fostered a strong environment for interdisciplinary research.

Memories and Pictures

Fulbright Reception



Davis Bike Route and Memories



Indian Festivals



Marriage Pics



Marriage Pics



Marriage Pics



Marriage Pics



Marriage Pics



Marriage Pics



Reception Pics



Reception Pics

