Schedule For Summer Program Student Presentations 2016

Date	10:00 – 10:30	10:30 – 11:00	11:30 – 12:00	12:00 – 12:30
June 27	Kaustubh Kumar – Faster exact and Parameterized algorithm for feedback vertex set in tournaments	Sanjana Sahayaraj – A use case of the theorem prover Isabelle	Pankaj Pundir – On Minimum Average Stretch Spanning Trees in Grid Graphs	Anirban & Debraj – Language Equivalence for Deterministic Pushdown Automata (**12:00–13:00**)
June 28	Thejaswini – An introduction to Timed Automata	Gandham Krishna – Simpler Parameterized Algorithm for Odd Cycle Traversal (OCT)	M Shiva Ganesh – Subset feedback vertex in a chordal graphs	N Lakshmanaram – Exact Exponential algorithms for OCT
June 29	Pooja & Akshaya – B-Chromatic Number in the realm of parameterized	Praveena – Split vertex deletion meets vertex cover	Vignesh Sairaj – Another Disjoint Compression Algorithm for OCT	Ritam & Rajarshi – Infinite graphs as solution of fixed point equation and its relation with MSO Logic (**12:00–13:00**)
June 30	Aashish Satyajith – Selfish Routing	Divya Sanghi – Space over time for exponential algorithms	Pranav R – Efficient Algorithms on Cliques	S Vipin – Introduction to zero knowledge proof systems
July 1	Anusha & Subiksha – Representative Sets in Hamiltonian path	Atlanta Chakraborty – Combinatorial games and puzzles	Deepanshu Kush – 3/4-approximation algorithm for MAX-SAT	Vaishali & Sachin – Greedy online algorithms and Freckles graphs * Rian Neogi – Vizing like theorem for vertex distinguishing edge coloring (**14:00–14:30**)

Abstracts of Talks

Thejaswini: In the early 90's, R. Alur and D. Dill, came up with an automata, known as the 'Timed Automata' to model real-time systems. In this presentation, we will define this model and see some basic language theoretic properties of Timed Automata.
Sanjana: The paper tries to formalize and verify the safety of an electronic hotel room system. Two models state based and trace based are discussed. HOL of Isabelle is being used in this paper to define the states, events, traces and to design the case based proof.

Anirban & Debraj: A decidability proof for deterministic pushdown automata equivalence by Petr Jancar (2012) which provides an alternative for Géraud Sénizergues decidability proof (1998,2005) for nondeterministic pushdown automata with deterministic popping ϵ-steps will be presented. The proof uses decidability of trace equivalence for first order grammars. We will show a poly-time reduction from dpda language equivalence problem to first order grammar trace equivalence problem and introduce the prover-refuter game to exhibit decidability of first order grammar trace equivalence problem.

Pankaj: A minimum average stretch spanning tree (MAST) of a graph is a spanning tree that minimizes the average stretch. Let G be an unweighted graph and T be a spanning tree of G. The stretch of an edge $e \in G$ not present in T is the distance between its vertices in T. The average stretch of T is the sum of the stretches of non-tree edges divided by the number of such edges. Finding an MAST in general graphs in known to be NP-complete. We provide a characterization of an MAST in grid graphs, a linear-time algorithm to construct it, derive an expression to find the total stretch of an MAST, and the total number of MASTs in grid graphs.

Ritam & Rajarshi: Based on Courcelle's work, we will review graph-grammars for infinite graphs and sketch the decidability of MSO theory.

Gandham Krishna: I would like to present on odd cycle transversal (OCT) using iterative compression from the paper "Simpler Parameterized Algorithm for OCT" by Daniel Lokshtanov , Saket Saurabh, Somnath Sikdar. It has the running time of $O(3^k.k.|e||v|)$.

Lamshmanaram: Designing Exact Exponential Algorithms using the Fixed Parameter Tractable Algorithms available for Odd Cycle Transversal.

Deepanshu: We'll combine the (1-1/e)-approximation randomized rounding algorithm using LP and the simple 1/2-approximation combinatorial randomized algorithm for MAX-SAT to come up with a 3/4 approximation guarantee for MAX-SAT.

Aashish: Introduce some concepts from game theory (Nash equilibrium, Price of Anarchy etc) through a paradox (Braess's paradox - wherein adding edges to a flow network actually degrades network performance rather than enhance it).

Vipin S: In communication it is often desirable to prove that you are in possession of some information without revealing it. For example you may need to prove that you have the password to your account without sending the password across as a third party might be listening in. Or you might need to prove to a client you have some information without revealing it. The objective of a zero knowledge proof system is to obtain a system in which it is possible for a prover to convince a verifier of his knowledge of a certain secret without disclosing any information except the validity of his claim. In the lecture we will be covering an introduction to zero knowledge proof systems as well some practical applications in cryptography.

Pranav: The k-Clique is an important NP-Complete problem. Specifically, when k is fixed, the best known running time is of the order $O(n^{.792k})$ but it is inapplicable as it includes complex matrix multiplication. We present an algorithm for k-clique that runs in $O(n^k/(\epsilon \log n)^{k-1})$ time and $O(n^\epsilon)$ for all $\epsilon > 0$ for a graph with n vertices when k is fixed.

Praveena: In this split vertex deletion problem, given a graph G and an integer k,we ask to delete at most k vertices from graph to obtain a split graph.We show that up to a factor quasi polynomial in k and a polynomial in n, solving split vertex deletion problem is same as solving vertex cover problem. Also we prove for any graph G, computing a family P containing partitions of V(G), such that for any two disjoint sets x,y subsets of V(G) where G(x) is clique and G(y) is independent set, there exists a partition in P, let say(L,M) where x,y are subsets of L,M respectively.

Pooja & Akshaya: We explain the B-Chromatic Number in the realm of parameterized complexity and exact exponential time algorithms. We show that B-Chromatic Number is W[1]-hard when parameterized by k.

Divya: Many exponential time algorithms need exponential space, which for real applications are less preferred over polynomial space. I will discuss technique to gain space over time , particularly for dynamic programming algorithms like Travelling Salesman Problem and Coloring Problem.