Paper length (your papers) are required to be a minimum of 6 pages, spacing of 1.5 lines and margins of no more than 1" on all sides.

Sample Topics for Papers and Presentations

A great source of interesting papers are those recently published by Christos Papadimitriou

http://dblp.uni-trier.de/pers/hd/p/Papadimitriou:Christos_H=

Computer-Assisted Theorem Proving

Semi-Automated Theorem Proving

http://homotopytypetheory.org/book/

Four-Color Problem

http://www.ams.org/notices/200811/tx081101382p.pdf

Collatz Conjecture: The 3x+1 problem

https://www.maa.org/sites/default/files/pdf/upload_library/22/Ford/Lagarias3-23.pdf

Factor Replacement

$2x \rightarrow x$

$x \rightarrow 3x+1$

Unordered Factor Replacement or Petri Net

$2x \rightarrow x$

$2x+1 \rightarrow 6x+4$

2-Tag System where start with a sequence of a's

$a \rightarrow bc$

$b \rightarrow a$

$c \rightarrow aaa$

Chen, H-L, Doty, D. & Soloveichik, D. (2014). Rate-independent computation in continuous chemical reaction networks. *Proceedings of the 5th Innovations in Theoretical Computer Science Conference*, (Princeton, New Jersey, USA, January 12-14, 2014), pp. 313-326.

http://www.dna.caltech.edu/~ddoty/papers/dfccrn-journal.pdf

Chen, H. L., Doty, D., & Soloveichik, D. (2012). Deterministic function computation with chemical reaction networks. In *DNA Computing and Molecular Programming* (pp. 25-42). Springer Berlin Heidelberg.

http://www.dna.caltech.edu/~ddoty/papers/dfccrn-journal.pdf

Cook, M. (2004). Universality in elementary cellular automata. *Complex Systems*, *15*(1), 1-40.

http://www.complex-systems.com/pdf/15-1-1.pdf

Doty, D. (2012). Theory of algorithmic self-assembly. *Communications of the ACM* 55(12): 78-88.

http://www.dna.caltech.edu/~ddoty/papers/tasa.pdf

Doty, D., Lutz, J. H., Patitz, M. J., Schweller, R. T., Summers, S. M., & Woods, D. (2012). The tile assembly model is intrinsically universal. In *Foundations of Computer Science (FOCS) 2012*, 302-310.

http://www.dna.caltech.edu/~ddoty/papers/tamiu.pdf

Neary, T., & Woods, D. (2006). P-completeness of cellular automaton Rule 110. In *Automata, Languages and Programming* (pp. 132-143). Springer Berlin Heidelberg
http://link.springer.com/chapter/10.1007/11786986_13
Ahmadi, A., Olshevsky, A., Parrilo, P., Tsitsiklis, J. (2013). NP-hardness of Deciding Convexity of Quartic Polynomials and Related Problems. *Mathematical Programming*, February 2013, Volume 137, Issue 1-2, 453-476
http://link.springer.com/article/10.1007%2Fs10107-011-0499-2#
Kevin Leyton-Brown, Holger H. Hoos, Frank Hutter, and Lin Xu. (2014). Understanding the empirical hardness of *NP*-complete problems. *Commun. ACM* 57, 5 (May 2014), 98-107.
http://cacm.acm.org/magazines/2014/5/174350-understanding-the-empirical-hardness-of-np-complete-problems/fulltext
Fabio L. Traversa, Chiara Ramella, Fabrizio Bonani, and Massimiliano Di Ventra1 (2014). Memcomputing NP-complete problems in polynomial time using polynomial resources and collective states,
http://arxiv.org/pdf/1411.4798v2.pdf

Textbook resources for topics that you might choose from

Arora&Barak, *Computational Complexity: A Modern Approach*, Cambridge University Press, 2009.
http://www.cs.princeton.edu/theory/complexity/
Oded Goldreich, *P, NP, and NP-Completeness: The Basics of Complexity Theory*, Cambridge University Press, 2010.
http://www.wisdom.weizmann.ac.il/~odedg/bc-drafts.html
Oded Goldreich, *Computational Complexity: A Conceptual Approach*, Cambridge University Press, 2008.
http://www.wisdom.weizmann.ac.il/~odedg/cc-drafts.html

Examples from above are:

- Interactive Proofs
- Probabilistic Computation
  - PCP Theorem (Hardness of Approximation)
  - Probabilistic Proof Systems
- Quantum Computing
- Randomized Algorithms
  - Promise Problems

Topics from Last Year
(Not available this year unless some new results came out in last year)

- Compute Arbitrary Functions Over Encrypted Data
- Turing test as a defining feature of AI-completeness
- On NP-Completeness of modularity based algorithms for community detection in graphs
- Complexity Analysis on the NP-hard problem of “Generalized Minimum Clique

Problem” and Studying two tractable solutions for solving it.
On the undecidability of probabilistic planning and related stochastic optimization problems
On A fast algorithm for equitable coloring"
Saving space by algebraization
NP-Completeness of the Minimum Manhattan Network Problem
Testing properties of sparse images
Statistical Model Checking
Rush Hour is PSPACE-complete, or "Why you should generously tip parking lot attendants"
Short Lists with Short Programs in Short Time
Rule 110
UNO is hard, even for a single player
Modeling multiple-object tracking as constrained flow optimization problem
Universality in Elementary Cellular Automata
On the computational complexity of a game of cops and robbers.
Self-Assembly for Computation
Complexity of Classic Video Games
Closing Complexity Gaps for Coloring Problems on H-Free Graphs
Deterministic function computation with chemical reaction networks
Turing and Super-Turing Capabilities of Neural Networks
A Comprehensive Study of Self-Assembly in Various Computational Environments
A Hypergraph Partitioner for Sparse Matrix Partitioning
An Energy Complexity Model for Algorithms