CS 6160 Cryptology Lecture 0: Introduction & Logistics

Maria Francis

August 17, 2021

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- We will cover the basics of modern cryptography like one-way functions, provable security, reductionist arguments.
- We then give an overview of symmetric key cryptography, public key cryptography (PKC) and then look at some advanced techniques like zero-knowledge proofs, anonymous credentials and post quantum crypto.

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- The number theory required will be covered in class but this is a good basic resource: http://www.hyperelliptic.org/ tanja/teaching/cryptoI13/nt.pdf

Syllabus

Classic cryptosystems, perfect secrecy, one-way functions, pseudo random generators, private and public key cryptography, collision resistant hashing, PKI, digital signatures, secret sharing schemes and zero knowledge proofs.

Introduction to Cryptanalysis, Attacks on block ciphers: exhaustive search, time-space tradeoffs, differential & linear cryptanalysis, meet in the middle, Attacks on public key systems: Integer factoring, Cryptanalysis of Hash functions, Overview of side channel attacks

References

- Cryptography Theory and Practice by D. Stinson. A standard textbook.
- Introduction to Modern Cryptography J. Katz and Y. Lindell. A new textbook with a very modern take.
- A Graduate Course in Applied Cryptography D. Boneh, V. Shoup. More practical engineering!
- The Foundations of Cryptography Vol 1 O.Goldreich. For the theoretical foundations of modern crypto, a good reference for one-way functions and ZK proofs.
- An introduction to number theory and cryptography N.
 Koblitz. For the number theory used in crypto.
- The Code Book" by S. Singh & "The Codebreakers" by D. Kahn. Both chronicle the history of crypto.

Other References

- Lecture notes by
 - Shafi Goldwasser and Mihir Bellare (collected into a single document but slightly old),
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- Explore and utilize all resources -
 - ► lecture notes,
 - ► video lectures (from reputed sources like university lectures, Simons Institute, Institute for Advanced Study, etc),
 - ► papers published at top venues like Crypto, Eurocrypt, Asiacrypt, Indocrypt, etc and journals like Designs, Codes and Cryptography, Journal of Cryptology etc.

- We meet using this Google meet link : E slot, Tues (10:00-10:55), Thurs (12:00-12:55) and Fri (9:00-9:55).
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- We will have a quiz on the topics the following Friday.
- Attendance will be taken, 10% of your final grade!
- TAs for this course: will be announced soon.

Evaluation!!

- Attendance 10% ($\leq \frac{1}{3}$ 0 marks, $\leq \frac{2}{3}$ 6 marks, $\geq \frac{2}{3}$ 10 marks.
- Quizzes 50% (Previously announced, mostly every week, online 10 minute quizzes)
- Paper presentation by a video, Report of a paper 20% + 20% = 40%

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- Plagiarism or any form of cheating will be an automatic F and will be reported to the dept.

Quizzes

- Will be given as a Quiz Assignment (MCQs and short answers) in Google classroom/SAFE app.
- After it is assigned you will have ten minutes to give your answers.
- Dates of the quizzes will be announced in advance.
- The plan is to conduct approx. 12 (could be more or less) quizzes and to account for network issues we will not consider 3 of them.

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- To score more:
 - ► Include more pictorial representations of the material to reflect your understanding,
 - ► Show the progress in this area so far and also the progress in the area post this paper, etc.

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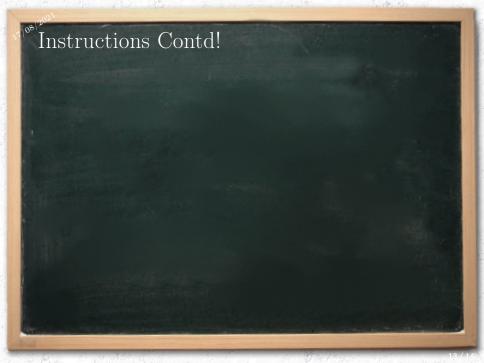
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