Blockchain and Cryptocurrencies: Technical and Strategy Perspective

Spring 2021

Undergraduate (UG)

Professor:
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Course Description:

Bitcoin has entered the mainstream media in 2011, with the WikiLeaks affair. Since then the enthusiasm for cryptocurrencies and blockchains went beyond libertarians and has also captured the markets and also corporate world. Unfortunately, while the hopes for the technology is high, the technology itself is poorly understood. With that, it is difficult to devise a successful business strategy that leverages the technology possibilities. And so we see a large number of failing start-ups in the space, together with underperforming corporate projects.

In this course, we to go beyond the headlines and equip future managers with sufficient technical background so that they'd be able to assess what type of blockchain or related technologies will be useful for their business application. We will study how the technology can be designed to meet the strategic needs, and how the strategy can be adjusted to take advantage of the unique features provided by the technology. We will learn that often the real features are different than the ones touted in the media headlines.

Pre-requisites: Foundations of Fintech
Other requirements: While the course is targeted towards future managers, not computer scientists, you will be expected to make effort to understand the several technical aspects of blockchain technologies.

Course structure:
The course is divided in two parts. The first part consists of lectures and class discussions on topics fundamental to understanding blockchains and crypto-economics at the level of practical applicability. The second part of the course will be devoted to an in-depth team project. We will cover topics related to the projects you have chosen. We will also regularly discuss the progress and challenges in the projects not only within groups, but also between groups, to better learn from each other.

Course readings:
There is no textbook. Readings will be made available via links or posted pdfs. For more technical readings, the guidelines will be provided which technical parts are optional. The syllabus may be updated several times during the semester to reflect the availability of new readings or guest speakers.

Evaluation:
Evaluation will be based on participation in class, short quizzes, and the in-depth project due at the end of the semester.

Lecture topics:

Week 1
Classes 1 & 2: Review of Bitcoin and Bitcoin's blockchain
Papers:
- Halaburda, Haeringer, Gans and Gandal (2020), "Microeconomics of cryptocurrencies", NBER working paper
- Narayanan and Clark (2017),"Bitcoin's Academic Pedigree", ACM Queue

Blog:
- Greenberg (2019), "A 'Blockchain Bandit' Is Guessing Private Keys and Scoring Millions", Wired Magazine

Week 2
Classes 3 & 4: Design Choices in Blockchain and Alternative Consensus Mechanisms (with and without cryptocurrencies)
Papers:
- Halaburda and Sarvary (2016), "Cryptocurrencies," in "Beyond Bitcoin: The Economics of Digital Currencies"
- Ali and Nerula (2020), "Redesigning digital money: What can we learn from a decade of cryptocurrencies?", MIT working paper
- Saleh (2018), "Blockchain Without Waste: Proof-of-Stake", McGill University working paper

Blogs:

- Orcutt (2017), “Wait, Bitcoin Just Did What?,” MIT Technology Review
- Orcutt (2018), “How secure is blockchain really?,” MIT Technology Review
- Faife (2018), “A 51% Attack Exposes Vertcoin’s Greatest Strength as a Fatal Flaw,” Breakermag

Week 3

Classes 5 & 6: Ethereum & Smart Contracts

Industry Report:

- “Smart Contracts: 12 Use Cases for Business & Beyond,“ Chamber of Digital Commerce

Blogs and newspaper articles:

- Hamacher (2019), “Why Bosch is jumping on the Ethereum blockchain"
- Istuk, Ardic and Allen (2020) “Will smart contracts usher in a new wave of financial inclusion?,” World Bank Blogs
- Kelly (2019), “When is a blockchain startup not a blockchain startup?,” FT Alphaville
- “A beginner’s guide to Ethereum,” Coinbase Blog

Week 4

Class 7: Financing Through Crypto-Tokens

Paper:

- Howell, Niesser and Yermack (2019), “Initial Coin Offerings: Financing Growth with Cryptocurrency Token Sales,” NYU working paper

Blogs:

- Kasireddy (2017), ``Bitcoin, Ethereum, Blockchain, Tokens, ICOs: Why should anyone care?,” Hackernoon
- Robinson (2018), “SEC Tries to Scam ICO Investors to Show Them How Easy It is,” Bloomberg
- Schiller (2018), “On This Blockchain-Based Version of Airbnb, There Is No Middleman,” FastCompany
- Dale (2019), “Decentralized Airbnb Starts Charging Fees as ICO Model Falters,” Coindesk

Class 8: Internet of Things, IOTA & Cuvva case study

Paper:

- Bakos and Halaburda (2020), "Smart contracts, IoT Sensors, and Efficiency,” NYU working paper

Blogs and newspaper articles:

- Lavercombe (2018), “All About IOTA: What It Is and How It Works,” Medium
- Littlejohns (2019), "What is Cuvva? Hourly car insurance for infrequent drivers,” NS Insurance
- Hurst (2019), “UK Insurtech Startup Cuvva Secures £15 Million Through Series A Funding Round,” Crowdfund Insider

Week 5

Classes 9 & 10: Dapps and DeFi

Papers:

- Ertz and Boily (2018), "The Rise of the Digital Economy: Thoughts of Blockchain Technology and Cryptocurrencies for the Collaborative Economy," University of Quebec working paper
- Leiponen (2020), "Platform ecosystem in the dApp economy," Cornell University working paper

Blogs:

- Cameron-Perry (2018), ``BitCult: Drinking the Crypto Kool-Aid," LinkedIn
- Barber (2019), "New to Blockchain: Turning In-Game Virtual Goods to Asset," Wired Magazine
- Fadilpasic (2018), "We Tested Augur and This Is How it Went," Cryptonews
- Orcutt (2019), "This Blockchain-Based Card Game Shows Us the Future of Ownership," Medium

Weeks 6 & 7: Permissioned blockchains — designs, use cases; successes and limitations

Class 11: The Case for Permissioned Blockchains

Papers and reports:

- Lopez, Montresor and Datta (2019), "Please, do not decentralize the Internet with (permissionless) blockchains!," IEEE 39th International Conference on Distributed Computing Systems (ICDCS)
- Yermack (2017), "Corporate Governance and Blockchains," Review of Finance
- IBM Blockchain Survey (2018)

Blog:

- Kadiyala (2018), "Nuances Between Permissionless and Permissioned Blockchains," Medium

Class 12: Case study: Hyperledger Fabric and IBM Blockchain solutions

Paper:

- Kuesters, Rausch and Simon (2020), "Accountability in a Permissioned Blockchain: Formal Analysis of Hyperledger Fabric"

Blogs and videos:

- "IBM Hyperledger — How nodes reach a consensus on blockchain," YouTube
- Hill (2018),"IBM struggles to sing up shipping carriers to blockchain supply chain platform," The Register

Class 13: Case study: Ripple and Stellar

Paper:

- Cachin and Tackmann (2019), "Asymmetric Trust"

Blog:

- Won (2020), "XLM vs XRP (Stellar vs Ripple): The 2020 Full Comparison," Exodus

Class 14: Case study: Lucidity, and comparison between the cases
Blogs:

- Dunaway (2019), "Yes, Virginia: Blockchain Can Scale," AdMonsters
- Faridi (2020), "Blockchain-based Smart Contracts Used in Digital Payments Pilot," Crowdfund Insider
- Chavez-Dreyfuss (2019), "Harvard, Levi Strauss, U.S, think tank in blockchain tie up on worker welfare," Reuters

Weeks 8-12:
Topics related to the projects chosen & project progress discussions

Weeks 13-14:
Classes 25-27: Presentations of projects & feedback

Week 14:
Class 28: Lessons learned and wrap-up