

**Proposals for Master Degree Thesis**  
**Research Group on**  
**Blockchain and Social Networking**  
**Reference: Laura Ricci**  
**May 2018**

This document presents a set of topics for Master Thesis related to research areas I am currently investigating with my research group.

• **Research Area: blockchain technology**

1. *Tecnologia blockchain per il trading energetico peer-to-peer*

Il mercato dell'energia sta attraversando una vera e propria rivoluzione dovuta alla sua liberalizzazione e all'avvento dei prosumers, consumatori che sono al tempo stesso piccoli produttori di energia da fonti rinnovabili. I modelli tradizionali di trading basati su un mercato centralizzato che opera su base giornaliera o settimanale non sono quindi piú adeguati per scenari in cui il numero e la frequenza delle transazioni fra micro-produttori cresce esponenzialmente. Lo scopo della tesi é di progettare e sviluppare le API di accesso e gestione di una piattaforma di trading peer-to-peer dell'energia basata su tecnologie blockchain open source, che permetta agli utenti di inviare, eseguire ed archiviare ordini e transazioni in modo flessibile e con tempi di risposta brevi. La tesi prevede la realizzazione di una dApp che definisca un front-end utilizzato dai trader per ricevere ed eseguire le transazioni. La tesi si inquadra nell'ambito di una collaborazione del mio gruppo di ricerca con IIT-CNR, nell'ambito di un progetto su blockchain che raggruppa sia partner accademici che industriali.

2. *A blockchain-based support for social networking.*

The recent increase in reported incidents of privacy and security breaches in social networks are mainly due the centralized nature of these networks, which enables third-parties to collect and control massive amounts of personal data. This thesis regards the definition of a framework for the support of a social network which exploits both the blockchain and the Distributed Hash Table (DHT) technology. The idea is to define a system that turns a blockchain into an access-control manager for social contents, that does not require trust in a third party. Unlike Bitcoin, transactions in the defined system are not financial, they are used to store, query and share social data. While content is stored on the DHT, the blockchain will register pointer to the content, together with the related access control policies. Smart contracts will be exploited to trigger specific actions on the shared content, for instance the revoking of right the access the content in presence of some event.

The system will be implemented by exploiting the Ethereum blockchain, which will be accessed through a local node. *This thesis investigates a research topic suitable as a basis for a PhD research proposal.*

3. *Modelling the behaviour of Bitcoin's users through temporal networks*

Graph theory provides a language for studying the structure of relations and is used to study interactions over time too. However, it poorly captures both the temporal and structural nature of interactions. For these reasons graph concepts have been generalized to cope with these new aspects, giving rise to new formalisms, like that of temporal networks. This thesis will investigate these new formalisms and then, it will exploit them to describe pattern motifs which can be found in the Bitcoin transaction graph. We have started to investigate these motifs in a previous bachelor thesis, but we want to perform a deeper analysis of the graph to discover further interesting patterns. Therefore this thesis will include both theoretical and applicative aspects. *This thesis investigates a research topic suitable as a basis for a PhD research proposal.*

## • Research Area: Distributed Online Social Networks

### 1. *SONIC-MAN: exploiting communities in Distributed Online Social Networks*

During the last decades, we witnessed an ever-increasing usage of Online Social Networks (OSN) from users, both for private life and for marketing purposes. What we are seeing in the last few years is more and more attention and concern from common users about the data they put on OSN. Typically OSN are free to use, but, in return, they require a permission to users to use their data in a number of ways. But people do not want to see their data sold to the best offerer, because they feel their privacy is violated: Cambridge Analytica was just the very last episode of this kind. One proposed solution to never let this kind of events happen again, is to distribute the service among the users themselves. Distributed Online Social Networks (DOSNs) have been developed. In DOSNs a user can decide where their private data is stored and who has access to it. The distribution of the service helps giving a fairer service to users, but also introduces a number of new problems: How data is provided by the service? How is information spread in the network? The privacy of users is really safe now? This thesis is proposed in the framework of a project for developing DOSNs, that has been developed from our group in the last years. The aim of this thesis is the development, improvement and evaluation of tools to discover and manage social communities in a DOSN. The main idea is to improve SONIC-MAN (SOcial dyNamic Community MANager), a system which has been developed in a previous master thesis. SONIC-MAN is a distributed protocol to detect a set of communities in the ego-network of a user. A moderator is chosen for each community, which is in charge of managing the user's data when he/she is offline. At the present time, moderators are chosen at random, but defining sophisticated and smart strategies is a must in such dynamic and energy efficient contexts. We are currently investigating how to improve the two main aspects of the algorithm: the formal definition of community and the moderator election strategy. Of particular interest is to evaluate the usage of a linear predictor, within SONIC-MAN, to consider the availability of the users in the DOSN when electing moderators.

### 2. *Analysis of a Blockchain-based Online Social Networks: Steemit*

A new generation of Decentralized Online Social Networks exploits the blockchain technology. These represent platforms in which users can exchange information and relevant content and earn rewards, for instance for posting interesting content. The most famous one is *Steemit*, <https://steemit.com/>, where anyone can earn rewards by posting relevant content. There are three main currencies in Steemit: Steem, Steem Power (SP) and Steem Backed Dollars (SBD). User accounts can upvote posts and comments similar to other blogging websites or social news websites like Reddit, and the authors who get upvoted can receive a monetary reward in a cryptocurrency token named Steem and Steem Dollars. People are also rewarded for curating (discovering) popular content. Curating

involves voting comments and post submissions. Vote strength and curation rewards are influenced by the amount of Steem Power held by the voter. Despite the characteristics of Steemit are clear, the behaviour of users has not been yet studied. This thesis will develop a system to retrieve the information exchanged in Steemit and all the information concerning users of Steemit in order to study more in deep the behaviour of the users of this social network and compare it with other Online Social Networks.

### 3. *Retrieving information from Twitter by exploiting hashtag analysis*

Thanks to current Online Social Networks information can reach a huge amount of people, possibly influencing public opinion, new product market share, or brand awareness. In recent years, interest among researchers and marketers alike has increasingly focused on whether or not diffusion can be maximized by seeding a piece of information or a new product with certain special individuals, often called influencers who exhibit some combination of desirable attributes - whether personal attributes like credibility, expertise, or enthusiasm, or network attributes such as connectivity or centrality, that allows them to influence a disproportionately large number of others, possibly indirectly via a cascade of influence. How individuate influencers is an open problem. Twitter is expressly devoted to disseminating information, in that users subscribe to broadcasts of other users; thus the network of who listens to whom can be reconstructed by crawling the corresponding follower graph. We are trying to study how to retrieve influencer in Facebook by considering a centrality point of view. The goal of this thesis should be to study of the influencers in Twitter by exploiting the most important hashtags and analyse the behaviour of users to understand which users are influencers or not. Furthermore, we want also compare this analysis with our previous one, concerning the Facebook groups.