

	FORM FOR PROPOSING A TOPIC IN THE SECOND CYCLE OF STUDIES	Oznaka	
		Datum usvajanja	09.04.2020
		Datum/Br. revizije	-
		Stranica	1/1

Department	IT
Master thesis title:	Generating the Language of Stakeholders: NLP for the FCC Filings
Mentor/professor - contact: Co-mentor/professor contact:	elma.avdic@ibu.edu.ba

Thesis background:	The language in which the stakeholders write to decision-making institutions such as the Federal Communications Commission (FCC) is not the language used in everyday life. The nuances of it, and the coded vocabulary make it difficult for lay people to interpret whether a stakeholder is in favour or against a motion they are responding to during the open consultations process. This project is focused on applying Natural Language Processing (NLP) and/or sentiment analysis to the FCC filings. The impact the work might have is in providing insights into an automation of the regulatory decision-making, which often slows down the technological progress due to burdensome and costly decision making process.
Thesis objective:	The outcome of the work is an NLP model that is able to process the policy language used in rulemaking process. A student will create an model to which a random FCC filing can be imported to determine whether a stakeholder voted for or against a specific policy proposal of the regulator, exploring in what kind of language the filing is written. The type of filing can involve any kind contemporary technological regulation and rulemaking proposal (spectrum sharing, mmWave bands regulations, IoT regulations, etc.). Additionally, based on the criteria selected and quality metrics to evaluate the model, a clustering of filings will be performed as well, to gain insight into the impact of filings to a final regulatory decision. The work will fit within a wider vision of introducing machines to govern things, enabling machines to assist in rulemaking and tackling the issues of AI-based decision making which may represent the future of rulemaking.
Literature:	<p>[1] Schmidt, A. and Wiegand, M., 2017, April. A survey on hate speech detection using natural language processing. In <i>Proceedings of the Fifth International Workshop on Natural Language Processing for Social Media</i> (pp. 1-10).</p> <p>[2] Belinkov, Y. and Glass, J., 2019. Analysis methods in neural language processing: A survey. <i>Transactions of the Association for Computational Linguistics</i>, 7, pp.49-72.</p> <p>[3] Belova, A., Grabmair, M. and Nyberg, E., 2019. Segmentation of Rulemaking Documents for Public Notice-and-Comment Process Analysis.</p> <p>[4] O'neil, C., 2016. <i>Weapons of math destruction: How big data increases inequality and threatens democracy</i>. Broadway Books.</p>

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Department	IT
Master thesis title:	In Search for Patents: Modelling Technology Innovation
Mentor/professor - contact: Co-mentor/professor contact:	elma.avdic@ibu.edu.ba

Thesis background:	This research project is focused on applying data science techniques to patent search, in order to make conclusions about technological innovation. The student will choose one of the technologies proposed by the supervisor and make an attempt at quantifying history of a particular technological category, how it depends on scientific progress, tracking the evolution of knowledge on that particular technology over a certain time period. The main question is what makes a certain technology a success story.
Thesis objective:	The goal is to identify technological changes and generalise conclusions which can tell us more about the successful technological design and prediction of future progress, based on the lessons learned from the past. One of the objectives is demonstrating if certain technologies must rely on scientific knowledge, or if their progress is more driven by the industry and commercial factors.
Literature:	<p>[1] Pichler, A., Lafond, F. and Farmer, J.D., 2020. Technological interdependencies predict innovation dynamics. <i>Technological Interdependencies Predict Innovation Dynamics (March 2, 2020)</i>.</p> <p>[2] Hötte, K., Pichler, A. and Lafond, F., 2020. The rise of science in low-carbon energy technologies. <i>arXiv preprint arXiv:2004.09959</i>.</p> <p>[3] Margulis, C., 2017. The Application of Big Data Analytics to Patent Litigation. <i>J. Pat. & Trademark Off. Soc'y</i>, 99, p.305.</p> <p>[4] https://dlab.berkeley.edu/blog/big-data-and-patent-analytics</p>

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Department	IT
Master thesis title:	The Role of Data in CBRS: Implications and Governance
Mentor/professor - contact: Co-mentor/professor contact:	elma.avdic@ibu.edu.ba

Thesis background:	<p>This project explores the role of data in a CBRS spectrum sharing model proposed by the Federal Communications Commission (FCC) for a 3.5 GHz band. Recognising that the data is what drives the new economy today, opening new directions in both, business and governance, this work will address the issues of data sharing in a complex spectrum sharing ecosystem, made out of many different kinds of stakeholders, the regulator and the citizens. The question is should this data be private or public and what would be the benefits of publicisation of data, considering the need to protect the stakeholders' business interests, and as such, poses the need for exploring a more general question, the one about the nature of data in 5G and beyond.</p>
Thesis objective:	<ol style="list-style-type: none"> 1. Create a framework based on a sharing economy model that takes into account data sharing in a dynamic spectrum sharing CBRS scenario, in which the data generated and exchanged between the stakeholders plays a crucial role. 2. Explore the usage of blockchain for CBRS spectrum access databases, information exchange, coordination and spectrum monitoring. 2. Create a set of policy recommendations to the regulator based on the results generated by different kinds of analyses performed.
Literature:	<p>[1] Yrjölä, S., 2017, September. Analysis of blockchain use cases in the citizens broadband radio service spectrum sharing concept. In <i>International Conference on Cognitive Radio Oriented Wireless Networks</i> (pp. 128-139). Springer, Cham.</p> <p>[2] Massaro, M. and Beltrán, F., 2020. Will 5G lead to more spectrum sharing? Discussing recent developments of the LSA and the CBRS spectrum sharing frameworks. <i>Telecommunications Policy</i>, 44(7), p.101973.</p> <p>[3] Weiss, M.B., Werbach, K., Sicker, D.C. and Bastidas, C.E.C., 2019. On the application of blockchains to spectrum management. <i>IEEE Transactions on Cognitive Communications and Networking</i>, 5(2), pp.193-205.</p> <p>[4] AVDIC, E., 2019. <i>Culture of Spectrum Sharing: Emancipation of the hertz</i> (Doctoral dissertation, Trinity College Dublin).</p>

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Department	IT
Master thesis title:	ABM Modeling of Incentive Relationships in the CBRS band
Mentor/professor - contact: Co-mentor/professor contact:	elma.avdic@ibu.edu.ba

Thesis background:	<p>Spectrum sharing ecosystem is occupied by different kinds of stakeholders (traditional carriers, small-scale operators, database providers, equipment vendors, user device manufacturers, regulators, the citizens). For each of them the question of incentives and sharing stimulation must be asked. This work aims at answering how to motivate users to share spectrum by using a spectrum sharing CBRS model for 3.5GHz as a case study. Agent-based modeling and simulation (ABMS) is a tool for modelling systems of autonomous, interacting agents, that also include behavioral models (human or else) which we use to explore collective effects of agent behaviours and interactions. An agent is an autonomous, computational individual or object with particular properties and actions.</p>
Thesis objective:	<p>ABM enables powerful and cheap computation, manipulation with large data sets and is easy to understand. There are lots of methods and toolkits for developing agent models, this work will mainly use NetLogo.</p> <p>The work on this topic involves: (1) understanding the concepts of ABM and the concepts of incentivisation in a spectrum sharing system; (2) extending the work conducted in [4] where stakeholders interactions and policy positions are mapped in details, i.e. their behaviour is observed. These results will serve as an input to ABM model, whose output (the observed behaviour) feeds the decision making process. Additionally, we may use Promise theory of Mark Burgess as a policy-based management tool; (3) generating results and conclusions;</p>
Literature:	<p>[1] Nwogugu, M.I., 2019. <i>Earnings Management, Fintech-Driven Incentives and Sustainable Growth: On Complex Systems, Legal and Mechanism Design Factors</i>. Routledge.</p> <p>[2] Bustamante, Pedro and Gomez, Marcela and Weiss, Martin B. H. and Znati, Taieb and Park, Jung-Min and Das, Debarun and Rose, J Stephanie, <i>Agent-Based Modeling Approach for Developing Enforcement Mechanisms in Spectrum Sharing Scenarios: An Application for the 1695-1710mhz Band</i> (March 16, 2018). TPRC 46: The 46th Research Conference on Communication, Information and Internet Policy 2018.</p> <p>[3] Papadias, C.B., Ratnarajah, T. and Slock, D.T., 2020. <i>Spectrum Sharing: The Next Frontier in Wireless Networks</i>. John Wiley & Sons.</p> <p>[4] AVDIC, E., 2019. <i>Culture of Spectrum Sharing: Emancipation of the hertz</i> (Doctoral dissertation, Trinity College Dublin).</p>

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Department	IT
Master thesis title:	An IoT-based Spectrum Monitoring for a 5G use case scenario
Mentor/professor - contact: Co-mentor/professor contact:	elma.avdic@ibu.edu.ba

Thesis background:	Radio spectrum monitoring as part of the spectrum management process helps the regulators in frequency planning, spectrum allocation and licensing, and in managing the interference between spectrum users. The existing problems of current spectrum monitoring systems are centered around large and expensive monitoring equipment, lack of adequate processing of the monitoring data, and an underutilisation of time and location dimensions of spectrum resource. There is a need for a platform which is cloud-based, enables dynamic and intelligent spectrum management in real-time and deploys many spectrum sensors to open the possibilities of smart spectrum monitoring.
Thesis objective:	This research project needs to survey current problems in spectrum monitoring and to propose a model architecture for an IoT-based spectrum monitoring in a 5G use case scenario. The work involves: (1) understanding the concepts of spectrum monitoring and the role it plays in spectrum management; (2) understanding the concepts of IoT networks and how they utilise spectrum; (3) modeling the architecture based on 5G scenario requirements for spectrum utilisation; (4) generating results and making conclusions;
Literature:	<p>[1] Shbat, M., Ordaz-Salazar, F.C. and González-Salas, J.S., 2018, September. Spectrum Sensing Challenges of IoT Nodes Designed under 5G Network Standards. In <i>2018 15th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE)</i> (pp. 1-6). IEEE.</p> <p>[2] Dutkiewicz, E., Jayawickrama, B. A., & He, Y. (2017). Radio spectrum maps for emerging IoT and 5G networks: Applications to smart buildings. 2017 International Conference on Electrical Engineering and Computer Science (ICECOS).</p> <p>[3] Cotton, M., Wepman, J., Kub, J., Engelking, S., Lo, Y., Ottke, H., Kaiser, R., Anderson, D., Souryal, M. and Ranganathan, M., 2015, March. An overview of the NTIA/NIST spectrum monitoring pilot program. In <i>2015 IEEE Wireless Communications and Networking Conference Workshops (WCNCW)</i> (pp. 217-222). IEEE.</p> <p>[4] International Telecommunication Union (2011). Spectrum monitoring handbook. Retrieved from: https://www.itu.int/pub/R-HDB-23-2011/zh</p>