

# MSc. in Computing Practicum Approval Form

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## Section 1: Student Details

Project Title:	Browser API for managing and recording web consent
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Chosen major:	Data Analytics, Secure Software Engineering
Supervisor	Harshvardhan J. Pandit
Date of Submission	24/11/2023

## Section 2: About your Practicum

**What is the topic of your proposed practicum? (100 words)**

**Browser API for managing and recording web consent:**

Introducing a comprehensive Browser API for web consent management, our primary goal is to record and store user consent transparently. This API enables users to track data usage, identify providers accessing personal information, and seamlessly revoke consent at their discretion. Enhancing user control and data awareness, our solution ensures a user-centric approach to privacy, fostering trust and empowering individuals in the digital realm.

**Please provide details of the papers you have read on this topic (details of 5 papers expected).**

1. V. Jesus and H. J. Pandit, "Consent Receipts for a Usable and Auditable Web of Personal Data," in *IEEE*, 2022.

The research identifies consent receipts as inspiration drawn from shopping receipts, offering a potential solution to the shortcomings in current consent practices providing detailed use-case implementations for generating consent receipts during website interactions and through Consent Management Platforms. This study serves as the base idea on which the extension would be leveraged.

2. Eugenia Politou, Efthimios Alepis, Constantinos Patsakis, Forgetting personal data and revoking consent under the GDPR: Challenges and proposed solutions, *Journal of Cybersecurity*, Volume 4, Issue 1, 2018, tty001, <https://doi.org/10.1093/cybsec/tty001>

The insights from the research provide a solid foundation for enhancing the development of the consent management API for web cookie banners. Implementing user-friendly features such as transparent reporting and easy modification or revocation of consent ensures a positive user experience. The research's emphasis on user control inspires the inclusion of customisable consent durations, allowing users to specify how long their consents remain valid. Leveraging the research's focus on GDPR compliance, our API can assure websites of robust data protection measures, while detailed reporting functionalities contribute to a transparent and accountable consent management process. Overall, the API improves website administrators' ability to seamlessly integrate and comply with privacy regulations, offering a comprehensive and user-centric solution for efficient consent management.

3. F. Y. Al Nawaj'ha and M. S. Abutaha, "How to build your digital signature on your Web site," *2013 World Congress on Computer and Information Technology (WCCIT)*, Sousse, Tunisia, 2013, pp. 1-5, doi: 10.1109/WCCIT.2013.6618694.

The above research on digital signatures provides valuable insights that can significantly enhance the security and integrity aspects of your consent receipt revocation API. By leveraging digital signatures, our API can implement robust authentication mechanisms, ensuring that consent revocation requests are genuinely initiated by authorised users.

4. Xiao, Z., Li, T.W., Karahalios, K. and Sundaram, H., 2023, April. *Inform the Uninformed: Improving Online Informed Consent Reading with an AI-Powered Chatbot. In Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems.*

The authors created an AI-powered chatbot called Rumi to improve online informed consent comprehension, and they evaluated its efficacy against a conventional form-based method. When compared to the form-based group, participants who were randomly allocated to the chatbot condition showed significantly higher levels of satisfaction and comprehension. These results imply that AI-driven chatbots can enhance online informed consent procedures by answering participants' inquiries and offering tailored answers.

5. M. Assale, E. Barbero and F. Cabitza, "Digitizing the Informed Consent: the Challenges to Design for Practices," *2019 IEEE 32nd International Symposium on Computer-Based Medical Systems (CBMS)*, Cordoba, Spain, 2019, pp. 609-615, doi: 10.1109/CBMS.2019.00127.

To improve the informed consent process for patients, this study explores the difficulties encountered in designing the DICE electronic informed consent application. The study assessed the usability of DICE and concluded that while patients appreciated its interactive features, healthcare professionals expressed concerns about its practical implementation in real-world settings. The main worry stemmed from the possibility of placing undue pressure on medical staff to respond quickly to patient inquiries resulting from the interactive features of the program. This emphasises how important it is to take healthcare providers' workflow and time restrictions into account when creating these kinds of technologies.

**How does your proposal relate to existing work on this topic described in these papers? (200 words)**

Our proposal for a browser API or extension to manage and record user consents, including revocation requests using a digital signature, aligns with and builds upon existing research. The first research on consent receipts provides the foundational concept akin to shopping receipts, inspiring the development of your API for generating and managing consents during website interactions. The second research enhances your solution by emphasising user-friendly features such as transparent reporting and customisable consent durations, ensuring GDPR compliance and a positive user experience. Lastly, the third research on digital signatures significantly strengthens the security and integrity aspects of your API, offering robust authentication mechanisms for consent revocation requests. Additionally, Integrating ISO/IEC 27560:2023 into our API empowers organisations to enhance transparency, accountability, and GDPR compliance in their PII(Personally Identifiable Information) processing practices. In the fourth research paper, the AI-powered chatbot assists users in understanding consent forms. Through analysing user-chatbot interactions, machine learning models can forecast which explanations or information will most likely lead users toward acceptance and understanding. The models in the papers can aid in understanding user preferences, personalising consent experiences, and optimising the design of consent requests while considering ethical implications.

**What are the research questions that you will attempt to answer? (200 words)**

1. How can implementing a JSON format for recording and storing consent on visited websites serve as an effective solution to empower users with increased awareness and control?

This aims to counter manipulative tactics employed by specific websites, ultimately preventing the unauthorised collection and sharing of personal data for diverse purposes.

2. How does presenting historical acceptance/rejection rates of consent forms affect users' decisions regarding online consent, considering factors such as transparency, user trust, and decision-making autonomy?

Transparency, especially in the form of empirical facts, might impact users' judgments when permission form acceptance/rejection rates are shown historically. But prioritising other people's decisions over personal preferences and background it may unintentionally influence users' decisions, undermining their autonomy to make decisions.

3. What measures can be taken to protect the privacy of individuals while using machine learning models to analyse consent form data?

Don't gather more personal information than is required for the analysis. De-identify the information by taking out direct identifiers such as social security numbers, names, and addresses.

**How will you explore these questions? (Please address the following points. Note that three or four sentences on each will suffice.)**

- What software and programming environment will you use?

- VSCode - Development environment to code and test the javascript and java program.
- Browser - This will be used for installing and testing the developed extension.
- Jupyter Notebooks for interactive data analysis and model building.

- What coding/development will you do?

- HTML, CSS, Javascript - For extension development
- Java (JCA API) - For developing the Digital signatures
- Python - For data analysis and machine learning model

- What data will be used for your investigations?

- For our investigations in real-time API development, we will utilise data from web consents, including information such as consent categories, timestamps, expiry details, and other relevant data extracted from web consent records.
- For the training model, we will create synthetic datasets that imitate the features of consent form interactions if actual historical data is few or nonexistent. For testing, simulated datasets can be made using programs like Faker or synthetic data generators.

- Is this data currently available, if not, where will it come from?

- The data is currently available from web consent records. We will source this information directly from websites that implement consent management systems, ensuring we have accurate and up-to-date data for our research.

- What experiments do you expect to run?

- The experiment will involve users interacting with the API, giving consent, and the system recording this information. The data, including consent categories, timestamps, and other relevant details, will be neatly formatted into cards on a user-friendly dashboard. We'll evaluate user awareness and control by analysing how effectively users can interpret and manage their consent through the dashboard. Additionally, we'll run tests on the consent revocation process, exploring the user experience when revoking consent.
- In this experiment, a pop-up message system will be implemented on a website, showing users the past acceptance or rejection rates for particular permission form types as they come across them.

1. For, eg, for a consent form that receives more approvals:

"Historically, 70% of users have accepted this consent form."

2. For, eg, for a consent form with a higher rejection rate:

" This consent form is typically declined by 80% of users."

- What output do you expect to gather?

- Providing users with instant insights into consent usage, enhancing transparency and awareness.
- The JSON format proves adaptable to various websites, ensuring versatility in consent management.
- Pioneering a secure and non-repudiable digital signature system for consent revocation.
- Keeping track of how users engage with the website, paying particular attention to how they react to the pop-up messages about acceptance/rejection rates of consent forms.

- How will the results be evaluated?

- User Interaction: Examining how users engage with the dashboard and comprehend consent details easily
- Revocation Success: Assessing the effectiveness of the digital signature-based system in preventing undesired data collection through consent revocation.
- User Feedback: Gathering insights on user experience and satisfaction to gauge the effectiveness of the improved consent management system.
- Acceptance/Rejection Rates: By comparing the consent form acceptance and rejection rates from before and after the pop-up messages were introduced. Examine whether user behaviour has changed significantly.