

## Master of Science in Information and Data Science

# IBM Watson Chatbot Challenge

Module description	
<b>Module name</b>	Conversational AI – Virtual Assistants
<b>Most recent change</b>	February 2022
<b>Module concept</b>	<p>Conversational artificial intelligence (AI) is no longer science fiction, but an increasingly mainstream capability with which consumers interact daily in their homes, workplaces, and on the go. Usually known as bots, chatbots, or virtual assistants, this conversational AI makes up a crowded and confusing enterprise market, leading buyers with many “bot” versions that may not talk to each other effectively. Watson Assistant is IBM’s virtual assistant solution that allows users to interact with business systems using natural human language. IBM has married a technically robust conversational platform with developer and line-of-business-friendly tools with the breadth of the broader Watson portfolio. Enterprises can build and train the AI solution to serve a wide range of use cases across applications, devices, and channels.</p> <p>The module aims are to design enterprise-specific conversational use cases and implement them using state-of-the-art frameworks of IBM Watson Assistant. You will get insights into the conversational design, natural language processing (NLP) in general and specifically in natural language understanding (NLU) and generation (NLG) as well as dialogue design. Further, you will get a glimpse into machine learning and knowledge engineering depending on the group project requirements and students preferences.</p> <p>The assessment is a group project focussing in a cross-functional team on a provided or real use case and a prototypical implementation during the course. These virtual assistants aim to create and solve a real business case of real companies. They are presented and evaluated by the companies at a final presentation.</p> <p>In this independent study module, 20% of the classroom time will be coaching; the first two sessions will be classical/directed input and hands-on lecture; later the learning is self-directed by working on the group work. A mid-term checkpoint to ensure the milestones of the project are on track.</p>
<b>Module type</b>	Elective Module – Advanced Analytics and Big Data and ML
<b>Form</b>	Independent Learning Module
<b>ECTS credits</b>	6 ECTS Credits
<b>Teaching language</b>	English
<b>Head</b>	Lars Mallien
<b>Adjunct lecturers</b>	Youri Bohler, Dorothee Reinhard, Andreas Martin, Domenic Largiadèr
Module positioning	
<b>Admission requirements</b>	
<b>Recommended semester</b>	Master Studies

<b>Module objectives</b>	
Overall objective	<ul style="list-style-type: none"> <li>Students can explain conversational systems by using conversational terms such as: entities, intents, utterances, context, slots/parameters, actions, dialogue design, disambiguation, digression, events, response, broadcast/push notifications and fulfilment</li> <li>Students can describe how knowledge-based systems and knowledge engineering could help to increase the natural language understanding (NLU)</li> <li>Students can describe how machine learning, intent matching, entity extraction, dialogue design and context can increase the user experience and containment</li> <li>Students can identify and solve a business case applying the Enterprise Design Thinking methodology, can train and integrate a virtual assistant</li> <li>Students identify the cost, benefit, flexibility, and risk factors that affect the investment decision, can explain ROI and indicate the PV, NPV</li> </ul>
Objective: <b>Professional skills</b>	<ul style="list-style-type: none"> <li>Students can execute a requirements elicitation phase for an AI-powered virtual assistant</li> <li>Students can design and construct a conversational system</li> <li>Students develop a data model</li> <li>Students train the virtual assistant with client data</li> <li>Students can construct and implement a conversational AI prototype, pilot or proof-of-concept</li> <li>Students can integrate backend services or APIs in the client environment or external webpage</li> <li>Students can address and integrate virtual assistant systems and other channels</li> <li>Students solve a client use case</li> </ul>
Objective: <b>Problem-solving and critical thinking</b>	<ul style="list-style-type: none"> <li>Students can identify use case by exercising Enterprise AI Design Thinking</li> <li>Students should be able to analyze and answer complex questions about the structure and dynamics of conversational flows</li> <li>Students can justify an overall conversational architecture based on a prior requirements analysis and/or design process</li> <li>Students should be able to assess the strengths and weaknesses of their work</li> <li>Students can outline further implementation flavors</li> <li>Students can identify potential for further enhancements of the virtual assistant depending on the use case (e.g. incorporating further Watson Services, connecting to an IVR system, adding more user languages, preprocessing the user utterance, process automation, incorporating webservices, etc.)</li> </ul>
Objective: <b>Method skills</b>	<ul style="list-style-type: none"> <li>Understand and apply the core concepts of conversational analysis by structuring and infusing the data into Watson Assistant</li> </ul>

	<ul style="list-style-type: none"> <li>• Solve a business case by identifying the appropriate tools and services that support a user-oriented solution</li> </ul>
Objective: <b>Communication skills</b>	<ul style="list-style-type: none"> <li>• Students can communicate best practices for building a conversational AI solution</li> <li>• Students understand the client's requirements and know how to translate those into milestones</li> <li>• Students can manage the client's expectations</li> <li>• Students can demonstrate and explain their solution to a non-technical audience</li> </ul>
Objective: <b>Interpersonal skills</b>	<ul style="list-style-type: none"> <li>• Students can investigate self-directedly further machine learning and/or knowledge engineering methods based on the conversational scenario</li> <li>• Students will work cooperatively within their teams in order to solve the business problem together</li> <li>• Students will take over responsibility and accountability for the work that they have committed themselves</li> </ul>
<b>Contents</b>	
Topic 1: Motivation and history	<ul style="list-style-type: none"> <li>• Enterprise AI Design Thinking</li> <li>• AI and non-AI Methods for Chatbot/Virtual Assistant</li> <li>• Conversational AI and Bot Lifecycle</li> <li>• Conversational Design and Engineering Process</li> <li>• Use Case Ideation and/or Requirements Gathering</li> <li>• Conversational and User Experience (UX)</li> <li>• General approach to Cognitive Computing - Cognitive Computing flavours</li> <li>• Introduction into Piloting and MVP</li> <li>• Integration of Conversational Channels</li> <li>• Introduction into Watson Assistant</li> </ul>
Topic 2: Core concepts and methods	<ul style="list-style-type: none"> <li>• Fundamental concepts of AI</li> <li>• Provision of service instances in IBM Cloud account</li> <li>• Introduction to Watson Assistant main concepts</li> <li>• Conversational Prototyping and Implementation</li> <li>• Data model (Intents &amp; Entities)</li> <li>• Ground truth (Training Data)</li> <li>• Basic Conversational dialogue design</li> <li>• Designing Multi-turn interactions</li> <li>• Optional: Search Skill</li> <li>• Decision trees and dialog features</li> <li>• Conversational Service Integration and Fulfillment</li> </ul>
Topic 3: Advanced topics	<ul style="list-style-type: none"> <li>• Programing User Interface</li> <li>• REST API calls</li> </ul>

	<ul style="list-style-type: none"> <li>• Analytics and conversation analysis</li> <li>• Integration (Chat Widget / Webhooks)</li> <li>• Handing over the conversation to an agent (Triage)</li> <li>• Connecting other Watson Services for preprocessing data</li> <li>• Testing methods for accuracy and containment</li> </ul>
Topic 4: Application	<ul style="list-style-type: none"> <li>• Introduction to Watson Conversation concepts</li> <li>• Chatbot Challenge Introduction and description</li> <li>• Client introduction</li> <li>• Instructions (Cooperation with client / Professors)</li> <li>• Criteria's to evaluate each team</li> <li>• Collecting use case requirements</li> <li>• Managing expectation</li> <li>• Defining goals and milestones</li> </ul>

<b>Teaching and learning</b>		
<b>Coursework:</b>	<b>Hours</b>	<b>Hours (%)</b>
Contact hours	20 hrs	20%
Coaching	20 hrs	20%
Self-study	60 hrs	60%
Other		
<b>Total</b>	<b>100 hrs</b>	<b>100.0%</b>

Details on teaching and learning methods:

Teaching and learning methods: <b>Classroom</b>	Presentation of core concepts and best practices through lectures and interactive discussion.
Teaching and learning methods: <b>Coaching</b>	Guided hands-on exercises using Watson Assistant. Exchange with Professors and IBM responsables.
Teaching and learning methods: <b>Self-study</b>	Group project work and reading background material
Teaching and learning methods: <b>Other</b>	n/a

<b>Assessments</b> (Adaptions are possible at any time.)		
<b>Assessments</b>	<b>Assessment 1</b>	<b>Assessment 2</b>
Type of performance record	Project presentation	Project mid-status
Evaluation type	Grade	Grade
Scope	The complete analytical process question formulation, data acquisition, result presentation. Group work.	Core concepts of the first half of the module. Group work
Date	End of module	During the semester
Weighting (if two assessments)	80%	20%
Aids/materials	none	none

Notes on the assessments:

Language	English
Certificates	n/a
Attendance	20% attendance requirement (introduction days and final presentation)

<b>Teaching material</b>	
<b>Literature</b>	Slides with methodological requirements and optional further readings will be handed out to students at the beginning of the semester.
<b>Lecture notes</b>	n/a
<b>Online resources</b>	Watson Assistant, Watson Discovery
<b>Software</b>	Watson Assistant, Watson Discovery
<b>Other resources</b>	n/a