6. APPENDIX

6.1. DEFINITIONS

- **Algorithms** are a set of rules or instructions which a computer can use to help solve a problem or decide what to do next.

- **Machine learning** means that the computer systems perform a specific task without using explicit programming instructions but implement different classes of algorithms and statistical models to learn iteratively, i.e. identifying patterns from different types of current and past data and using them to make predictions to solve different types of problems.

- **Deep learning** is a subset of machine learning. Deep learning algorithms are a class of learning algorithms that are becoming popular because of their effectiveness in tasks related to speech and computer vision. They are also described as a technique that teaches computers to do what comes naturally to humans. Algorithms of probabilistic predictive methods use deep learning methodology. This consists of a neural network composed of different layers performing AI functions that imitates the workings of the human brain in processing data and creating patterns for use in decision making.

- **Natural language processing (NLP)** usually abbreviated as NLP, is a branch of artificial intelligence that deals with the interaction between computers and humans using natural language. The goal of NLP is to read, decipher, understand and give meaning to human languages in a valuable way. Most NLP techniques depend on machine learning to extract meaning from human languages. *Real-world applications: personal assistants (e.g. Alexa, Siri), chatbots…*

- **Speech recognition** is an AI process that can map audio data to text data. With more voice usage data and computer efficiency, speech recognition accuracy rates have improved a lot over the last ten years. *Real-world applications: security (surveillance), home automation, automatic translation and transcription speech-to-text (real time speech writing).*

- **Computer vision techniques** are used for data composed of images. They can identify, classify and react to visual data. They are mostly used within neural network structure and deep learning models.
  Real-world applications: autonomous driving, medical imaging and diagnostics to identify cancer cells, astronomy to build the first direct image of a black hole.

- **Recommendation systems** are data filtering tools that make use of algorithms and data to recommend the most relevant items to a particular user.
  Real-world applications: video/audio streaming platform (Netflix, Spotify, YouTube…)

- **Text mining** describes when the computer systems extract and format text to better understand the syntax, context, sentiments etc.

6.2. SELECTED HISTORIC STEPS OF AI

1950	Alan Turing proposes the "Turing Test" as a measure of machine intelligence.
1970s	AI winter starts; funding and interest in AI reduces.
1990s	All areas of AI see major advances, with significant demonstrations of machine learning, intelligent tutoring, case-based reasoning, multi-agent planning, scheduling, uncertain reasoning, data mining, natural language understanding and translation, vision, virtual reality, games and other topics.
1997	The Deep Blue chess machine (IBM) defeats the (then) world chess champion, Garry Kasparov.
Late 1990s	Web crawlers and other AI-based information extraction programs become essential in widespread use of the World Wide Web.
2009	Google builds autonomous car.
2011	IBM's Watson computer eventually defeated in television game show Jeopardy.
2011-2014	Apple's Siri (2011), Google's Google Now (2012) and Microsoft's Cortana (2014) smartphone apps use natural language to answer questions, make recommendations and perform actions.
2014	Amazon launches Alexa, an intelligent virtual assistant with a voice interface that can complete shopping and other tasks.
2016	Natural language processing applied to software testing and test automation.
2017	AI used for anomaly-based intrusion detection/ prevention systems following WannaCry and Petya/ Non-Petya ransomware attacks.
2018	Alibaba language processing AI outscores top humans at a Stanford University reading and comprehension test, scoring 82.44 against 82.30 on a set of 100,000 questions. **Autonomous and semi-autonomous driving** • Embark and Starsky Robotics pursue semi-autonomous truck driving. Daimler invests heavily in autonomous technology for cars and trucks. **Drone delivery** • Amazon Prime Air expects to ship 86 percent of items ordered on Amazon weighing five pounds (about 2.3 kg) or less using drones. UPS deploys drones from trucks for residential delivery tests. The drone delivers the package autonomously, while the driver continues to the next delivery. The drone then redocks with the truck.
2019	**Voice assistants** • Siri, Alexa, Google Assistant and Cortana are more powerful than ever. Powered by natural language processing, voice assistants are now handling 40 percent of all searches. **Facial recognition** • Facial recognition is becoming common and unexceptional, particularly in public and retail spaces. Businesses combine wider resolution, web tracking and biometrics to rapidly understand how customers interact with a brand and what content is most relevant them as individuals. **Business** • Financial services, supply chains, retailers and manufacturers are moving from pilot initiatives to production. Data is the new "crown jewel", replacing oil.

6.3. TEMPLATE: YOUR AI RISK MANAGEMENT ROADMAP

To develop your own roadmap on AI, get your team up to speed on AI basics. Then organise a workshop and invite a diverse set of colleagues from within and outside your department. Consider different backgrounds and focus areas such as risk engineers, claims handlers, data scientists and data analysts to work on your company's roadmap.

WHAT PROBLEM DO WE AIM TO SOLVE?	RISK MANAGEMENT STEP	OUR USE CASE	OUR COMPANY'S / CLIENT'S BENEFITS	WHAT DATA AND HOW TO GET IT? BE SPECIFIC!	DEPENDENCIES	SCOPE OF PROOF-OF-CONCEPT

6.4. TOP READS

Here are some selected sources of information and training for risk managers and their teams to further develop their understanding of AI.

Learning

- An Executive Guide to AI
  by McKinsey
  https://www.mckinsey.com/business-functions/mckinsey-analytics/our-insights/an-executives-guide-to-ai

- Machine Learning for Humans - Simple, plain-English explanations accompanied by math, code, and real-world examples.
  by Vishal Maini and Samer Sabri
  https://everythingcomputerscience.com/books/Machine%20Learning%20for%20Humans.pdf

- Machine Learning: Implementation in Business
  by MIT Sloan School of Management, online short course

- We Need to Talk, AI - A Comic Essay on Artificial Intelligence
  by Dr. Julia Schneider, Lena Kadriye Ziyal
  https://weneedtotalkai.files.wordpress.com/2019/06/weneedtotalkai_cc.pdf

Ethics

- Ethics Guidelines for Trustworthy Artificial Intelligence (AI)
  by High-Level Expert Group on Artificial Intelligence (AI HLEG) - European Commission
  https://ec.europa.eu/futurium/en/ai-alliance-consultation/guidelines

- Recommendation of the Council on Artificial Intelligence, OECD/LEGAL/0449
  By Organisation for Economic Co-operation & Development (OECD)
  https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0449

Risk management

- AI and Risk Management – Deloitte
  https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Financial-Services/deloitte-gx-ai-and-risk-management.pdf

Reading references are shown with author first, while learning has title first. Suggest make consistent.

- J. Hurwitz and D. Kirsch (2018), Machine Learning for Dummies, IBM Limited Edition

- R. Schutt and C. O'Neil (2014) Doing Data Science: Straight talk from the frontline, O'Reilly Media

- V. Kale (2016) Big Data Computing: a Guide for Business and Technology Managers, CRC Press

6.5. FERMA EXPERT GROUP

FERMA is grateful to our subject-matter experts for their hard work and valuable insights without which this report would not be possible.

Philippe Cotelle
Head of Risk Insurance Management
AIRBUS DS

Tiago Dias
Assistant Vice President – Cyber Hazards
FM Insurance Europe

Jens-Daniel Florian
Head of Digital Strategy & Transformation
Marsh Continental Europe

Okay Güneş
Chief Data Scientist
AI Risk Services

Bénédicte Huot de Luze
Chief Executive Officer
AI Risk Services

Valérie Pilcer
Chief Executive Officer
Valorisk

Jörg Stalder
Senior Insurance Consultant
Siemens AG, CFF Insurance