RESEARCH LINE 2A	
COMPANY	Repsol
PhD THESIS SUPERVISOR (UPM)	Prof. Dr. Alberto Mozo *Computer Systems Engineering School* *Computer Systems Department*
PhD THESIS CO-SUPERVISOR (COMPANY)	Dr. José Antonio Martín *Advisor, Advanced Mathematics* *Repsol Technology Lab*
DESCRIPTION OF THE PhD THESIS PROJECT	The main objective of this PhD thesis is the integration and adaptation of the latest trends in deep learning to the analysis of time series sensor data. Using a more specific approach, this objective can be divided into several specific goals: 1. Pre-training models on unlabeled sensor datasets through self-supervised learning, as it is done with text and images. 2. Apply transfer learning to bring the knowledge of pre-trained models into downstream sensor-related tasks such as anomaly detection, classification or clustering, and compare their performance with standalone trained models. 3. Create methods to visualize and interpret the predictions of the trained models, from the big picture of analysing the top errors to the analysis of the interactions between neurons in the model. 4. Improve the robustness of model predictions with sensor data using techniques for uncertainty quantification in deep neural networks, such as MonteCarlo Dropout or deep ensembles. 5. Improve the quality of sensor data through deep learning based missing value imputation techniques. 6. Development of a software platform to showcase the results of the aforementioned objectives.
TRAINING ACTIVITIES	The successful applicant will work in a multi-disciplinary team of computer scientists and other engineers at Universidad Politécnica de Madrid and Repsol. The candidate is also expected to attend all schools and training events organized within the company and the research group he/she works on during the PhD. Participation in outreach activities will be a part of duties too. More specifically, some of the training activities that the project will undertake include: - Schools and workshops aimed to create a multidisciplinary background and train the ESR to work in multidisciplinary teams. - Training at UPM aimed to improve soft skills and extend knowledge in complementary disciplines. - Conferences and workshops outside UPM, even when the ESR does not present any research work, as long as the topic of the conference is related to the project. - Participation in the organization of training and dissemination events organised by the supervisors.
SECONDMENT(S)	The successful candidate will undertake two secondments of 3-6 months during the project. The first one will take place during the second year of the project, with the Application Platforms and Software Systems Research Lab led by Itai Segall in Nokia Bell Labs, Murray Hill, NJ, USA. This research group has experience in the application of machine learning and deep learning techniques in real world industries. The second secondment, to be held during the third year of the project, would be carried out at

	Leiden Institute of Advanced Computer Science (LIACS), Leiden, The Netherlands, under the supervision of Prof. Thomas Bäck. The research LIACS is one of the top institutes in Computer Science in Europe, and has a leading experience in Artificial Intelligence (e.g. Evolutionary Computation, Natural Computing, etc.) and its application to Industry. Please note that the description of these secondments is tentative and can change during the course of the project.
REQUIREMENTS FOR CANDIDATES	All qualified candidates irrespective of gender or nationality are welcome to apply as long as they meet the following conditions: - Academic degree in Computer Science or a related field (earned at the date of recruitment). - Background in machine learning, computational intelligence and/or data mining. A master's degree or any other official qualification on these topics will be a plus. - Very strong programming skills, in languages such as R, Python, Java or C++. - Excellent spoken and written command of English is required. We are looking for a talented and highly motivated candidate. He/she must have an independent and well-structured working style, as well as the ability to work in a team. Applicants will be required to meet the Marie Sklodowska-Curie Early-Stage Researcher eligibility criteria. In particular, at the time of appointment they should be within the first four years of their research career, have not been awarded a doctoral degree, and should not have resided in the host country (Spain) for more than 12 months in the last three years immediately before the appointment. Researchers are normally required to undertake transnational mobility (i.e., move from one country to another) when taking up the appointment.