



# newsletter

The Newsletter of the Patient Empowerment through Predictive Personalised Decision Support (PEPPER) Project

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## Editorial

**Dr. Clare Martin**

Project Coordinator



Welcome to the fourth issue of the PEPPER Project newsletter. Here you will find the usual project news update, including reports from presentations at the international IJCAI-ECAI artificial intelligence conference in Stockholm and also the Institute of Engineering and Technology in London. We also have a report from one of our patient participants, Goretti Mallorqui, who visited the Drassanes School in Spain. The first project video is still available here (<http://bit.ly/2BNwU2j>), and plans are afoot for a second one. If you would like to offer us any feedback please contact [contact\\_pepper@googlegroups.com](mailto:contact_pepper@googlegroups.com)

# I. Month 24 Meeting Report



The PEPPER project held its Month 24 meeting in Vienna, Austria in February 2018. The latest prototype of the PEPPER system was demonstrated to the Innovation Advisory Board (IAB) during the meeting, who gave extremely valuable feedback. The choice of venue was made in order to co-locate with the Advanced Technologies and Treatments for Diabetes conference ([ATTD 2018](#)). The consortium used this opportunity for dissemination via the newsletter and flyers as well as during a round-table discussion at an industry symposium organised by Cellnovo.

The symposium was chaired by Prof. Boris Kovatchev from the University of Virginia. Pau Herrero and Beatriz Lopez represented the PEPPER team during the discussion which was attended by over 300 conference delegates.



## II. Invited talk

Clare Martin was invited to speak about PEPPER at the BLESS U Workshop in Smart and Creative Healthcare of the Future in June 2018 at The Institution of Engineering and Technology (IET), London. The workshop brought together key stakeholders from different sectors and different disciplines including government officials, general practitioners, educators, academics, researchers, private sectors and NGOs

with an interest in and commitment to improving the efficiency and quality of healthcare services delivery and to shape the future development of healthcare technologies worldwide. The workshop included participants from China and Indonesia as well as the UK. Speakers shared their current healthcare system practices, lessons learnt and recent healthcare technology innovations.



### III. PEPPER News - IJCAI-ECAI2018



This year, our presence in the [IJCAI-ECAI 2018](#) congress has been worthwhile as usual. In addition, the current year, taking into account the accumulation of congresses (AAMAS, ICML, etc.) in the same moment and place; the number of people and the amount of purposes and events has been remarkable.

The congress has taken place in the beautiful capital of Sweden during the days 13-19 of July. As a congress headquarters, the organizers have chosen Stockholmsmässan building, which has good and big facilities. It was a great pleasure to see more than 150 posters!

Our main contribution in the congress was done during the first day of the congress. Both, Clare Martin (Oxford Brookes University) and Joaquim Massana (University of Girona), intervened in the congress presenting our proposals in the AIH-2018 (Artificial Intelligence for Health) workshop.

Clare Martin presented "The Role of Usability Engineering in the Development an Intelligent Decision Support System", where she explained the needs and the requirements of the usability when we are facing the process of development of an Intelligent Decision Support System. In the

presentation, Clare, used as example the PEPPER Insulin Recommender. The audience shown interest asking about the features of the whole PEPPER system.

On the other hand, Joaquim Massana, presented the work "Case-base maintenance of a personalized insulin dose recommender system for Type 1 Diabetes Mellitus". During the presentation, not only a brief introduction of the PEPPER Insulin Recommender was made, but also the new system for managing of the case-base of the recommender core was depicted deeply. The results of the experiments shown how the new maintenance system works properly and also how the patient health indicators improve. The issue that generated the most interest in the audience was the "concept drift", which describes, for our topic, the changes produced in the patient that makes the usual treatment (doses of insulin) ineffective.

Other interesting presentations made during the AIH 2018 workshop revolved around the automatic recognition of the pain in children analysing the face, how to keep the anonymity and the safety in the peoples with dementia tracking avoiding the social stigma, the forecasting of the deterioration of the circulatory system in Intensive Care Unit Patients or the control of the reliability of the AI in the medial decision making area.

Therefore, we close our participation in the IJCAI-ECAI 2018 another year satisfactorily, hoping that the next year in Macau, will be better or equal.

## IV. Interview: Manuel Puig Domingo



Manuel Puig Domingo is a Clinical Endocrinologist and for the past 8 years he has been appointed as the head of service in the endocrinology, diabetes and nutrition department at the [Germans Trias Hospital](#). Also, since 2014 he has been the research director of the [Germans Trias Research Institute](#).

**Have do you use or encountered any artificial intelligence Technology applied to healthcare domain**

Not really. There are certain initiatives but they are quite far for my feel. In my field of clinical work, I know there are people working on it. PEPPER is the first one I have to know in detail.

**Do you think that PEPPER can be useful?**

I think that more than useful is necessary. I hope that it will help (a lot) and certainly Artificial Intelligence has been applied successfully to other fields and it is about time it comes to the clinical field. I am sure it will work, there is still work to do but and an interdisciplinary team like the one PEPPER has is required to do so.

**Do you think the application of Artificial Intelligence can improve over time?**

Certainly, mathematicians are ready to help and in fact the more broad the scope of the participants in the research team, the further it will go. In addition, more and more scientists see that basic research is necessary but that applied research is the the way to go.

**Do you think that projects that use Artificial Intelligence will survive if there are some bad outcomes in the beginning? I.e. the overall architecture is correct but there are some cases where the correct solution cannot be found.**

Well, the history of science has plenty of these situations. One thing is demonstrate that the application of Artificial Intelligence is an obligation, but the objective is to make life easier for patients. I mean that we can try to build a Ferrari, a very sophisticated and refined machine with lots of power and very fast but also very difficult to drive. The first issue is to demonstrate feasibility safety and effectiveness, but at the very end, the product should not be complicated to be driven by the patient. Regular diabetes patients deal with it every day but they do not live for it and if the system is so complicated that they need to focus 100% of the time in the system, receiving and inputting information it will not ease their burden. The final effort to make, beside demonstrating that PEPPER algorithms work, is to make sure that it can hide the outcomes of good control (hypos and

hiperglucemia), transparently, intuitively, like an automatic car.

**Have you ever worked with an Artificial Intelligence insulin delivery system?**

No, not really. I have colleges in the surrounding area of Barcelona who are working together with engineers towards modelling algorithms to control sensors and insulin pumps, but I would not say that we use Artificial Intelligence.

**What do you think of PEPPER?**

Well, PEPPER is a very brave initiative and very necessary too. I hope that with the work of the different participants and their different knowledge combined it will be a success. Every initiative in research and innovation requires going through all the steps, which is a very time consuming process and there are pitfalls where you were not expecting problems, but I am very optimistic, nobody had work on this and it was time to assemble a support system to help. PEPPER's approach uses the smartphone as a control system, since there is no need to handle different machines, and the phone is used for other things in life besides calling, it is smart to include it there.

**From a clinician perspective, do you think that the use of a smartphone could be problematic regarding data protection?**

That is a big issue; there are hackers that can enter into your computer and phones.

I hope that this is something that will improve over time. Nevertheless, it is always a possibility. We will see the solutions that appear in the future.

**PEPPER is an EU funded, so the results will be release to the public. How would you like PEPPER to continue?**

I think that it does not matter what will be the final innovation path. The important thing is to demonstrate that this approach is robust, and only then we could consider a joint venture or a licensing system.

From a romantic point of view, maybe a joint venture is better, since you will be always there meaning that you will keep on with the development and refinement of the final product. Furthermore, if you are successful, opportunities will appear to make PEPPER grow stronger.

However, my personal preference does not matter as long as PEPPER keeps alive to keep going, because this is only the beginning of a long trip. After the first generation that will be released to the public, other generations may appear that may not be even focused on diabetes but to other conditions. From the endocrinologist and diabetologist point of view, for patients that need hormones to live every day, we try to find the best physiological replacement possible and this physiological replacement requires refined components for these therapies. Maybe after insulin, this product can be applicable to other domains in medicine.

## Other related news

Stopping type 1 diabetes from birth. Experts believe they may have found a way to prevent high risk babies from developing type 1 diabetes. <https://www.bbc.co.uk/news/health-44777939>



Researchers may have found new a way to help treat type 1 diabetes – and it's with a drug that has been on the market for over 30 years. Read the full article on the following link: <https://www.businessinsider.es/repurposing-anti-hypertension-drug-for-type-1-diabetes-2018-7?r=US&IR=T>



A newly identified genome signature could explain how the body deals with type 2 diabetes. <https://academic.oup.com/nar/advance-article/doi/10.1093/nar/gky570/5050628>



Gestational diabetes app cuts hospital appointments by a quarter. A pioneering smartphone app is successfully helping women who develop gestational diabetes manage their condition better. <https://www.diabetes.co.uk/news/2018/jun/gestational-diabetes-app-cuts-hospital-appointments-by-a-quarter-95039119.html>



Dexcom G6® CGM System Receives CE Mark. The new CGM system eliminates routine fingersticks for people with diabetes and is nearly one-third smaller than previous generation. <https://www.businesswire.com/news/home/20180612005366/en/Dexcom-G6%C2%AE-CGM-System-Receives-CE-Mark>



Watson Artificial Intelligence (AI) Helping People with Diabetes. New mobile app from Medtronic, Sugar.IQ™, applies AI technology from IBM Watson Health to help people with diabetes make more informed decisions. <http://www.diabetesincontrol.com/sugar-iq-watson-artificial-intelligence-ai-helping-people-with-diabetes/>



## V. Profile – Julian Shapely



Dr. Julian Shapely has a cross-functional engineering and scientific background, specialising in microsystems for drug discovery. Following Julian's degree in Biochemistry he studied for his Ph.D. in engineering at the University of Wales, Cardiff. He has worked with the International Space School at NASA in Houston, Texas. Following two years of postdoctoral experience within university and commercial environments, developed the founding technologies within the Cellnovo system which serves as the cornerstone of the Cellnovo Mobile Diabetes Management System. Julian has

experience of leading cross-functional teams from ideation through to regulatory approval, leading the quality team and design for manufacture, and the setup of a prototype manufacturing line. He currently serves as the Chief Science Officer at Cellnovo Limited and served as its Vice President of Quality, Regulatory and IP. Within his current role Julian is responsible for the scientific input into the product offerings, management of intellectual property, technology scoping and supporting the management in business and market development activities.

## VI. Dissemination

February 2018 <> July 2018

### **Personalised Adaptive CBR Bolus Recommender System for Type 1 Diabetes**

Ferran Torrent-Fontbona, Beatriz Lopez. IEEE Journal of Biomedical and Health Informatics, Accepted March 2018.

### **Prediction of hyperglycaemia and hypoglycaemia events using longitudinal data.** International Conference on Advanced Technologies & Treatments for Diabetes (ATTD).

Ferran Torrent-Fontbona, Natalia Mordvanyuk, Beatriz Lopez. Vienna, February, 14-17, Poster, accepted. Published in Diabetes Technology & Therapeutics, Vol 20, Issue S1, pp. A-80-A-81

### **The Role of Usability Engineering in the Development of an Intelligent Decision Support System.**

Joint Workshop on Artificial Intelligence in Health (AIH2018), Stockholm, July 13-14 2018.

Accepted.

Clare Martin, Arantza Aldea, David Duce, Rachel Harrison, Marion Waite.

### **Case-base maintenance of a personalised bolus insulin recommender system for Type 1 Diabetes Mellitus.**

Ferran Torrent-Fontbona, Joaquim Massana, Beatriz Lopez.

Joint Workshop on Artificial Intelligence in Health (AIH2018), Stockholm, July 13-14 2018.

Accepted.

## VII. Future events

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PEPPER will be showcased the 12th September at the Venture Fest Oxford, at Oxford Brookes University, Headington Campus.

This Venture Fest edition will focus in technology sectors with transformative potential like digital health, quantum computing, space and autonomous vehicles

Check out their website at <https://venturefestoxford.com/venturefest2018/>

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