



PROTEGO

PROTEGO optimizes unplanned events in homecare, using contextual AI to enrich alarm, monitoring, and recommender systems with personalized dynamic workflows.

Our ageing population requires more complex care, with people living longer with one or more chronic diseases. This puts an increasing pressure on the caregiving staff and available beds in residential care centers and hospitals. To mitigate this effect, care delivery should become more transmural and be offered at home, reserving residential care and hospitals for those in need of more intensive care. To facilitate this shift to homecare, dependable and accurate monitoring and follow-up systems for the elderly at home are crucial. Today already, they are increasingly equipped with Personal Alarm Systems (PAS) & monitoring devices (lifestyle monitoring, medical sensors, localization...). These generate alarms that are forwarded to a call center operator.

But the operator is often unable to quickly assess the priority and validity of the alarm, due to a lack of contextual and sensor data. As a result, one third of all interventions are false alarms. In addition, the nature of the required intervention is often hard to assess, leading to inefficient dispatching and use of resources, e.g., sending a nurse instead of family caregiver.

FRAMING THE RESEARCH OBJECTIVE

The goal of PROTEGO was to accelerate the shift to transmural care by increasing the feasibility of homecare for the elderly, mainly by creating a more protective environment at home. To do so, we investigated how to increase the efficiency of care organizations by optimizing the handling of acute, unplanned events. We then designed AI services that offer caregivers the required context, recommend actions, and make care workflows adaptive. This allows caregivers to accurately assess, manage, and dispatch unplanned requests for aid without compromising the safety and comfort of the people in need.

THREE MAIN OUTCOMES

1. Call assessment and pro-active alarming through contextual AI services

PROTEGO designed contextual AI services that assess the lifestyle of elderly people at home and detect anomalies. This was done with hybrid AI techniques that deduce insights by reasoning on a knowledge graph that combines domain knowledge, elderly profile information, and behavior derived from sensor data through machine learning. To train these hybrid AI techniques, we organized data collection campaigns in the HomeLab of imec - IDLab - UGent, which are available as open data (<https://dahcc.idlab.ugent.be/>).

Based on these insights from hybrid AI, two services were created. The first pro-actively generates alarms when anomalies are detected that are assessed to be severe enough to require immediate action. The second enriches the calls made by the elderly with context information that pinpoints possible causes of alarm, e.g. recent anomalies in sensor readings & behavior, recent activities & routines, and risk factors associated with diseases.

The contextual AI services enable to reduce the number of unidentified false calls and allow operators and caregivers to more accurately and efficiently assess, prioritize, assign, and handle calls.

2. Adaptive and interactive call workflows steered by recommenders

We also designed context-aware and explainable recommenders that consider all information about an alarm provided by the contextual AI services to suggest (a) the appropriate dispatching strategies (e.g. nurse, (in)formal caregiver or ambulance), and (b) which questions should be asked to the elderly to obtain better information to assess the call.

Additionally, an adaptive and interactive workflow was created that is able to cope with complex and changing contexts. It does so by dynamically steering the workflow configuration to handle a particular call. This is based on the incoming suggestions from the context-aware recommenders and the feedback from the end-user (call operator, caregiver).

These adaptive workflows allow increasing the decision speed and call assessment of the operators and reduce the workload and resources by optimizing the assignments, while maintaining the safety and comfort of the elderly.

3. Comprehensive and personalized caregiver dashboards

A further result is the design of two dashboards for a comprehensive overview of calls. The first is for the operator and translates the contextual AI services and recommender outputs to clear overviews and actionable insights. The second serves the caregivers and shows only the most salient information needed to handle the call and treat the elderly. In both cases, a recommender is used to decide which information is visualized, based on the profile of the elderly and situational context of the call. During evaluations, all stakeholders found the dashboards to be useful, intuitive, trustworthy and an improvement compared to their current workflows. They require less interaction and thus allow a more efficient dispatching and call handling.

NEXT STEPS

Televic Healthcare will enhance its AQURA care platform by offering new solutions for context-aware alarming and care communication. This includes a new lifestyle monitoring product line leveraging a new room terminal as connected gateway for location and sensor data, and new services and algorithms to accurately assess and prioritize acute events. Televic will offer these solutions to existing customers (institutional care) and expand its business to service flats and eventually home care. Amaron will include the dynamic workflow steering, interactive dashboarding, and integration with the ML2Grow recommender in its Workflower platform, stimulating connectivity and collaboration between healthcare providers and stakeholders.

ML2Grow will valorize the potential of its workflow-aware recommender and encompassing MLOps framework in health and other sectors.

Z-plus will identify the nice-to-haves and must-haves to achieve a better service. Depending on the results of this exercise, there will be a further collaboration with one or more groups of the consortium.

PROTEGO project partners:



The PROTEGO project was co-funded by imec, with project support from Agentschap Innoveren & Ondernemen

FACTS

NAME	PROTEGO
OBJECTIVE	Personalized alarming & contextualized dispatching through lifestyle monitoring
TECHNOLOGIES USED	machine learning, semantic intelligence, knowledge graphs, hybrid AI, recommender systems, eHealth, workflow management
TYPE	imec.icon project
DURATION	01/09/2020 – 30/11/2022
PROJECT LEAD	Pieter Crombez, Televic Healthcare
RESEARCH LEAD	Femke Ongenae, imec - IDLab - UGent
BUDGET	2.259.465,58 euro
PROJECT PARTNERS	Televic Healthcare, ML2Grow, Amaron en Z-plus
RESEARCH GROUPS	imec - IDLab – UGent



WHAT IS AN IMEC.ICON PROJECT?

The imec.icon research program equals demand-driven, cooperative research. The driving force behind imec.icon projects are multidisciplinary teams of imec researchers, industry partners and/or social-profit organizations. Together, they lay the foundation of digital solutions which find their way into the product portfolios of the participating partners.

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