Patient Condition Modeling in RPM systems: Heart Failure Hospitalization Prediction

Remote patient management (RPM) systems enable:
- Monitoring of vital signs of patients at home (blood pressure, weight, etc)
- Providing educational and/or motivational feedback to patients at home
- Alerts to medical professionals of patient’s at risk so that they can intervene to prevent worsening of patient’s condition and hospitalizations
- All with the aim of improving clinical outcomes of chronic patients, including mortality, hospitalization, and quality of life.

Our recent proposal:
- Possible architecture of next generation personalized RPM systems heavily based on knowledge discovery from RPM data leading to identification of potentially useful features and patterns for patient modeling and adaptation rules

Background and preceding work

Focus of this work is Heart Failure Hospitalization Prediction: On a daily basis, based on the available data about a patient at moment $t_i$, cast a prediction whether the hospitalization for this patient is likely within next 14 days period ($t_{i+1}$, $t_{i+14}$)

Our contribution: We proposed an approach to learn a classifier that utilizes information spread across different data sources and is able outperform the expert-authored rules used to trigger alerts

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Experimental evaluation on TEN-HMS dataset

<table>
<thead>
<tr>
<th>Classification model</th>
<th>TPR</th>
<th>FPR</th>
<th>YIndex</th>
<th>IBRate</th>
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<tr>
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<td>0.019</td>
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<td>Rule 2</td>
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</tbody>
</table>

S+D
- max TPR: 0.582
- min FPR: 0.555

S+H
- max TPR: 0.627
- min FPR: 0.541

S+D+H
- max TPR: 0.697
- min FPR: 0.546

S+D+H+FS
- max TPR: 0.708
- min FPR: 0.541

For further information please visit www.win.tue.nl/~mpechen/projects RPM/ or e-mail us at m.pechenizkiy@tue.nl