SYSTEMS-LEVEL QUALITY IMPROVEMENT

A Soft Computing Approach to Kidney Diseases Evaluation

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Abstract Kidney renal failure means that one's kidney have
unexpectedly stopped functioning, i.e., once chronic disease is
exposed, the presence or degree of kidney dysfunction and its
progression must be assessed, and the underlying syndrome
has to be diagnosed. Although the patient's history and phys-
ical examination may denote good practice, some key infor-
mation has to be obtained from valuation of the glomerular
filtration rate, and the analysis of serum biomarkers. Indeed,
chronic kidney sickness depicts anomalous kidney function
and/or its makeup, i.e., there is evidence that treatment may
avoid or delay its progression, either by reducing and prevent
the development of some associated complications, namely
hypertension, obesity, diabetes mellitus, and cardiovascular
complications. Acute kidney injury appears abruptly, with a
rapid deterioration of the renal function, but is often reversible
if it is recognized early and treated promptly. In both situa-
tions, i.e., acute kidney injury and chronic kidney disease, an
early intervention can significantly improve the prognosis.
The assessment of these pathologies is therefore mandatory,
although it is hard to do it with traditional methodologies and
existing tools for problem solving. Hence, in this work, we
will focus on the development of a hybrid decision support
system, in terms of its knowledge representation and reason-
ing procedures based on Logic Programming, that will allow
one to consider incomplete, unknown, and even contradictory
information, complemented with an approach to computing
centered on Artificial Neural Networks, in order to weigh
the Degree-of-Confidence that one has on such a happening.
The present study involved 558 patients with an age average
of 51.7 years and the chronic kidney disease was observed in
175 cases. The dataset comprise twenty four variables,
grouped into five main categories. The proposed model
showed a good performance in the diagnosis of chronic kid-
ney disease, since the sensitivity and the specificity exhibited
values range between 93.1 and 94.9 and 91.9–94.2 %,
respectively.

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