Paper v0 draft

Ben Trovato
Institute for Clarity in Documentation
1932 Wallamaloo Lane
Wallamaloo, New Zealand
trovato@corporation.com

G.K.M. Tobin
Institute for Clarity in Documentation
P.O. Box 1212
Dublin, Ohio 43017-6221
webmaster@marysville-ohio.com

Lars Thørväld*
The Thørväld Group
1 Thørväld Circle
Hekla, Iceland
larst@affiliation.org

ABSTRACT

In this section, we will ...

1. INTRODUCTION

...

1.1 Score and KPIs

we will briefly introduce introduce KPIs for monitoring the Data-Base System state...
health score is a overview estimation of current system state, which is computed according to expert's experience rule.

1.2 Problem Definition

- multi-step forecast for score
making forecast on system's health score provides great convenience for operation work. (make decision in advance). We define it as univariate multi-step forecast task because the whole forecasting horizon offers both value and tendency.
....

$$x_{t+H}, x_{t+H-1}, ..., x_{t+1} = model(\mathcal{C}_t; \Theta) \quad (1)$$

- figure out main factors(among KPIs) for score AND over score's forecasting horizon
health state(score) is currently summarized from Key Performance Indicators(KPIs). In different time interval, score is mainly affected by certain different KPIs called time-varying main factors. Figuring out the time-varying main factors of health score offers more details...In a time interval, a *kpi* is though as one of main factors when its correlation with score is relative strong. Assuming that we have a correlation measurement $R(X, Y)$ for univariate time-series X and Y, and time interval size is W. At time t, we can caculate $R(score[t - W + 1 : t], kpi^i[t - W + 1 : t])$ as $i - th$ kpi's correlation with score denoted as R_t^i. In fact, we want to get R_t^i over score's forecasting horizon. Actually, making forecast on each kpi is impossible compared with score forecast...Instead of predicting the each forecasting step of R_t^i, we focus on the their mean value over score's forecasting horizon through looking back on history data of R_t^i.
The remainder of this document is ...

2. FORMULATION AND MODEL

In this section, we ...

2.1 Framework Overview

- give a figure of the model framework
- given a brief introduction for the process steps

2.2 Multilevel Discrete Wavelets Transform

- MDWT's formulation
time-frequence analysis of signal process.

$$x(t) = \sum_k c_{j_0}[k]\ \varphi_{j_0,k}(t) + \sum_{j=j_0}^{J} \sum_k d_j[k]\ \psi_{j,k}(t) \quad (2)$$

In the signal space consisting of and wavelet functions $\psi_{j,k}(t)$, ...
- MDWT's advantage applied for time-seires forecasting task pattern of score time-series can be captured DWT transform domain. (decomposing the task into sub-taks and training seperately can achieve better performance)

2.3 seq2seq-based Forecast

- classic seq2seq model is build for NLP. the model can map input sequence to ouput sequence
- insight of seq2seq model when it is applied for multi-step forecasting task. the decoder component can be seen as State Space Model([Machine Learning for Spatiotemporal Sequence Forecasting: A Survey])

2.4 Correlation Measurement and Prediction

- correlation measurement $R(X, Y)$ function as Pearson Correlation Coefficient (PCC) Here, the modified PCC is computed as following.

$$R(X,Y) = \begin{cases} 0, & var(X) = 0 || var(Y) = 0 \\ PCC(X,Y), & else \end{cases} \quad (3)$$

- Gated-RNN for predicting mean PCC over score's forecasting horizon using history PCC data.

2.5 Joint Task

- Firtly, we must illustrate the relation between two task explicitly.
- Secondly, explain why (sharing the latency represtative vector), (constructing universe loss function) and (training jointly) are effective theoretically.

*This author is the one who did all the really hard work.

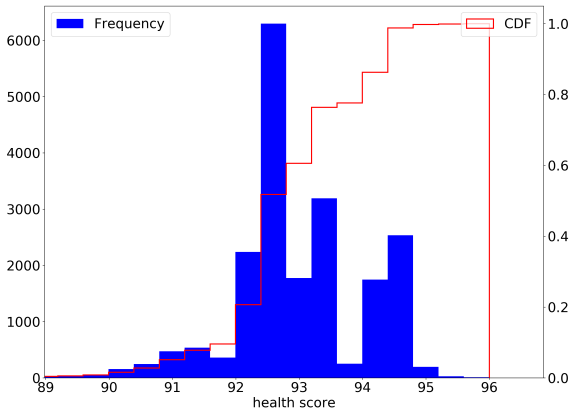

Figure 1: score distribution

3. EXPERIMENTS AND RESULTS

In this section, we ...

3.1 Data-Base Date Set

- discribe the source of the data set and its meaning
- give a statistics of health score distribution, Fig. 1.
(a figure about frequency and cumulative probability, x-axis is score bins and y-axis is frequency, after we ignore the outlier, not in $[mean - 3 \times std, mean + 3 \times std], 99\%$)
- give a figure about computed correlation between score and kpi, and illustrate correlation measurement's effectiveness.

3.2 Task I: Score's Multi-step Forecast

- multi-forecast method includes baselie: AR or ARIMA, basic-LSTM, seq2seq, MDWT-based seq2seq (and its joint version). List the corresponding MAE and RMSE as a table.
- MAE or RMSE's curve along with forecasting step' increase.
- visualize the result vector over forecasting horizon, (try to find another evaluation measurement for multi-step forecasting model)

3.3 Task II: correlation prediction

- mainly compare the seperate model and joint multi-task model (using correlation prediction RMSE or MAE, show that joint two relative task can improve model's performance....
- we can compute the (accuracy and recall) over Top M main factors, comparing seperate model and joint model and list the result as a table.

4. CONCLUSIONS

...

5. RELATED WORK

...

6. ACKNOWLEDGEMENTS

APPENDIX

A. HEADINGS IN APPENDICES

The rules about hierarchical headings discussed above for the body of the article are different in the appendices. In the **appendix** environment, the command **section** is used to indicate the start of each Appendix, with alphabetic order designation (i.e. the first is A, the second B, etc.) and a title (if you include one). So, if you need hierarchical structure *within* an Appendix, start with **subsection** as the highest level. Here is an outline of the body of this document in Appendix-appropriate form:

A.1 Introduction

A.2 The Body of the Paper

A.2.1 Type Changes and Special Characters

A.2.2 Math Equations

A.2.2.1 Inline (In-text) Equations.

A.2.2.2 Display Equations.

A.2.3 Citations

A.2.4 Tables

A.2.5 Figures

A.2.6 Theorem-like Constructs

A Caveat for the TEX Expert

A.3 Conclusions

A.4 Acknowledgements

A.5 Additional Authors

This section is inserted by LaTeX; you do not insert it. You just add the names and information in the `\additionalauthors` command at the start of the document.

A.6 References

Generated by bibtex from your .bib file. Run latex, then bibtex, then latex twice (to resolve references) to create the .bbl file. Insert that .bbl file into the .tex source file and comment out the command `\thebibliography`.

B. MORE HELP FOR THE HARDY

The acmproc-sp document class file itself is chock-full of succinct and helpful comments. If you consider yourself a moderately experienced to expert user of LaTeX, you may find reading it useful but please remember not to change it.