Data-Centric Engineering (2020), 1–6
doi:10.1017/dce.2020.7

DATA-CENTRIC ENGINEERING

TRANSLATIONAL ARTICLE

Example title: Evaluating probabilistic forecasts for maritime engineering operations

First Author[1], Second Author[2*] and Third Author[2]

[1]Graduate School or Faculty, Example Institute, City, Country
[2]FGraduate School or Faculty, Example Institute, City, Country
*Corresponding author. E-mail: example@cambridge.org

Received: 31 January 2020; **Revised:** 01 May 2020; **Accepted:** 06 May 2020

Keywords: offshore engineering; probabilistic forecasting; proper scoring rules; surface winds

Abstract

An abstract should be included, stating that this is a Translational Article and summarizing the aim, approach and any findings (250 words). Note that we welcome video abstracts. See the DCE Instructions for Authors: https://www.cambridge.org/core/journals/data-centric-engineering/information/author-instructions/preparing-your-materials

Impact Statement

Provide a 200 word impact statement that summarises the significance of the article in language that can be quickly grasped by a wide audience (including industry, government and wider academia).

1. Introduction

The Translational Section of DCE explores the role of computing in the data-driven world by introducing a new publications model, designed for academics, practitioners, and industry professionals, this publication acts as a catalyst for engagement with end-user organizations, effectively communicate the impact of their work to a broader audience, and receive recognition for their efforts. The focus is on creating engineering systems, or parts of systems, and tools where real-world data is collected, processed, and analyzed to support the needs of individuals and society “in the wild” outside the lab, in a testbed or full deployment. This field presents deep challenges in system design, data management, data collection, machine learning, and data science, among others. The journal focuses on applications in areas such as healthcare management, hardware innovations, data-driven manufacturing, and data-driven sustainability. As an emerging field, Data-Centric Engineering has the potential to bring about significant progress against societal and economic challenges when deployed in real-world settings. As these technologies continue to evolve at an increasing pace, it becomes crucial to have a pathway that enables impact at scale and facilitates knowledge transfer between researchers, practitioners, and industry. Example citation Liao et al. (2016)

The introductory section could describe the setting or environment in which the engineering system was implemented, challenges, and solutions, including testbeds, trials, or full deployments.

Related Work in Mobile Sensing

As an emerging field, Data-Centric Engineering has the potential to bring about significant progress against societal and economic challenges when deployed in real-world settings. As these technologies continue to evolve at an increasing pace, it becomes crucial to have a pathway that enables impact at scale and facilitates knowledge transfer between researchers, practitioners, and industry. Example citation Liao et al. (2016)

This section could describe the methodology and system approach used and how it enables knowledge transfer. Example citation Mba et al. (2018). The reference citations should used as per the "natbib" packages. Some sample citations: Alam and Saddik (2017); Chui et al. (2013); Oliveira et al. (2017); Talkhestani et al. (2018).

REFERENCES

Alam, **KM and Saddik**, **AE** (2017) C2PS: A Digital Twin Architecture Reference Model for the Cloud-Based Cyber-Physical Systems. *IEEE Access 5*, 2050–2062.

Bhat, **NN**, **Dutta**, **S**, **Pal**, **SK and Pal**, **S** (2016) Tool condition classification in turning process using hidden Markov model based on texture analysis of machined surface images. *Measurement 90*, 500–509.

Cai, **Y**, **Shi**, **X**, **Shao**, **H**, **Wang**, **R and Liao**, **S** (2018) Energy efficiency state identification in milling processes based on information reasoning and Hidden Markov Model. *Journal of Cleaner Production 193*, 397–413.

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

"The motivation for this work is to create a wearable gaming solution to increase physical activity while playing a fun and engaging game in open spaces."

Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

This section headings are not prescriptive aside from ending with Lessons Learned, which is required. The introductory section could describe the setting or environment in which the engineering system was implemented, challenges, and solutions, including testbeds, trials, or full deployments. Example citation Li et al. (2018).

2. Users

This section could describe the target users and the nature of any inter-, multi- and transdisciplinary collaborations.

2.1. Data sources

This section could describe the data sources used for the study and the rationale behind their selection.

We welcome pull quotes that help highlight the aim of the work, e.g. “The motivation for this work is to create a wearable gaming solution to increase physical activity while playing a fun and engaging game in open spaces.”

3. Methods

This section could describe the methodology and system approach used and how it enables knowledge transfer. Example citation Mba et al. (2018).

4. Equations

Equations in LaTeX can either be inline or on-a-line by itself. For inline equations use the `$...$` commands. Eg: The equation $H\psi = E\psi$ is written via the command $H\psi = E\psi$.

For on-a-line by itself equations (with auto generated equation numbers) one can use the equation or eqnarray environments *D*.

$$\mathcal{L} = i\psi\gamma^{\mu}D_{\mu}\psi - \frac{1}{4}F^{a}_{\mu\nu}F^{a\mu\nu} - m\psi\psi \tag{1}$$

where,

$$\begin{aligned} D_{\mu} &= \partial_{\mu} - ig\frac{\lambda^{a}}{2}A^{a}_{\mu} \\ F^{a}_{\mu\nu} &= \partial_{\mu}A^{a}_{\nu} - \partial_{\nu}A^{a}_{\mu} + gf^{abc}A^{b}_{\mu}A^{a}_{\nu} \end{aligned} \tag{2}$$

Notice the use of `\nonumber` in the align environment at the end of each line, except the last, so as not to produce equation numbers on lines where no equation numbers are required. The `\label{}` command should only be used at the last line of an align environment where `\nonumber` is not used.

$$Y_{\infty} = \left(\frac{m}{\mathrm{GeV}}\right)^{-3}\left[1 + \frac{3\ln(m/\mathrm{GeV})}{15} + \frac{\ln(c_2/5)}{15}\right] \tag{3}$$

The class file also supports the use of `\mathbb{}`, `\mathscr{}` and `\mathcal{}` commands. As such `\mathbb{R}`, `\mathscr{R}` and `\mathcal{R}` produces $\mathbb{R}$, $\mathscr{R}$ and $\mathcal{R}$ respectively.

5. Figures

As per the LaTeX standards eps images in `latex` and pdf/jpg/png images in `pdflatex` should be used. This is one of the major differences between `latex` and `pdflatex`. The images should be single page documents. The command for inserting images for latex and pdflatex can be generalized. The package that should be used is the graphicx package. See Figure 1.

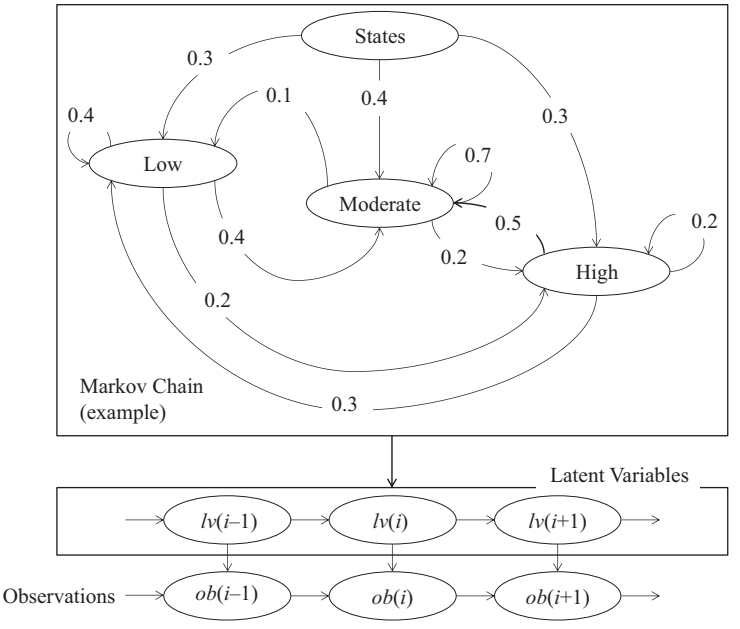

Figure 1. *The concept of hidden Markov model.*

6. Tables

Tables can be inserted via the normal table and tabular environment. To put footnotes inside tables one has to use the additional "fntable" environment enclosing the tabular environment. The footnote appears just below the table itself. See Table 1.

7. Cross referencing

Environments such as figure, table, equation, align can have a label declared via the `\label{#label}` command. For figures and table environments one should use the `\label{}` command inside or just below the `\caption{}` command. One can then use the `\ref{#label}` command to cross-reference them. As an example, consider the label declared for Figure 1 which is `\label{fig1}`. To cross-reference it, use the command `Figure \ref{fig1}`, for which it comes up as "Figure 1". The reference citations should used as per the "natbib" packages. Some sample citations: Alam and Saddik (2017); Chui et al. (2013); Oliveira et al. (2017); Talkhestani et al. (2018).

Table 1. *Tables which are too long to fit, should be written using the "table*" environment as shown here*

	Element 1			Element 2[1]		
Projectile	Energy	σ_{calc}	σ_{expt}	Energy	σ_{calc}	σ_{expt}
Element 3	990 A	1168	1547 ± 12	780 A	1166	1239 ± 100
Element 4	500 A	961	922 ± 10	900 A	1268	1092 ± 40

Note: This is an example of table footnote this is an example of table footnote this is an example of table footnote this is an example of table footnote this is an example of table footnote

[1]This is an example of table footnote

8. Lists

List in LaTeX can be of three types: enumerate, itemize and description. In each environments, new entry is added via the `\item` command. Enumerate creates numbered lists, itemize creates bulleted lists and description creates description lists. List in LaTeX can be of three types: enumerate, itemize and description. In each environments, new entry is added via the `\item` command. Enumerate creates numbered lists, itemize creates bulleted lists and description creates description lists.

1. This is the 1st item
2. Enumerate creates numbered lists, itemize creates bulleted lists and description creates description lists.
3. Numbered lists continue.

List in LaTeX can be of three types: enumerate, itemize and description. In each environments, new entry is added via the `\item` command.

- This is the 1st item
- Itemize creates bulleted lists and description creates description lists.
- Bullet lists continue.

9. Lessons learned

This is a required section. Conclude with some bullet pointed lessons learned about the deployment and engagement with the challenge owner. Who could or should replicate the study and for what purpose.

- Lesson one
- Lesson two
- Lesson three.
- an improved software module on the phone that prolongs battery life;
- an enhanced version of the Web por-tal, ideally one that reduces wait time and the amount of data shown to the user;
- an improved privacy policy setting as well as an enhanced user interface;
- a new way to handle mobile sensors and more advanced data aggregation algorithms;
- on-device visualization tools and mapping; and
- software that works with any smart phone on an open platform.

Acknowledgments. We are grateful for the technical assistance of A. Author.

Funding Statement. This research was supported by grants from the <funder-name><doi>(<award ID>); <funder-name><doi>(<award ID>).

Competing Interests. A statement about any financial, professional, contractual or personal relationships or situations that could be perceived to impact the presentation of the work — or 'None' if none exist

Data Availability Statement. A statement about how to access data, code and other materials allowing users to understand, verify and replicate findings — e.g. Replication data and code can be found in Harvard Dataverse: `\url{https://doi.org/link}`.

Ethical Standards. The research meets all ethical guidelines, including adherence to the legal requirements of the study country.

Author Contributions. Please provide an author contributions statement using the CRediT taxonomy roles as a guide `\url{https://www.casrai.org/credit.html}`. Conceptualization: A.A; A.B. Methodology: A.A; A.B. Data curation: A.C. Data visualisation: A.C. Writing original draft: A.A; A.B. All authors approved the final submitted draft.

Supplementary Material. State whether any supplementary material intended for publication has been provided with the submission.

References

Alam, **KM and Saddik**, **AE** (2017) C2PS: A Digital Twin Architecture Reference Model for the Cloud-Based Cyber-Physical Systems. *IEEE Access 5*, 2050–2062.

Bhat, **NN**, **Dutta**, **S**, **Pal**, **SK and Pal**, **S** (2016) Tool condition classification in turning process using hidden Markov model based on texture analysis of machined surface images. *Measurement 90*, 500–509.

Cai, **Y**, **Shi**, **X**, **Shao**, **H**, **Wang**, **R and Liao**, **S** (2018) Energy efficiency state identification in milling processes based on information reasoning and Hidden Markov Model. *Journal of Cleaner Production 193*, 397–413.

Chui, **MW**, **Feng**, **YQ**, **Wang**, **W**, **Li**, **PL and Li**, **ZC** (2013) Numerical Simulation of Rough Surface with Crossed Texture. *Applied Mechanics and Materials 321–324*, 196–200.

Fill, **H-G** (2017) SeMFIS: A flexible engineering platform for semantic annotations of conceptual models. *Semantic Web 8*(5), 747–763.

Fraser, **AM** (2008) *Hidden Markov models and dynamical systems*. Philadelphia: SIAM.

Kumar, **A**, **Chinnam**, **RB and Tseng**, **F** (2018) An HMM and polynomial regression based approach for remaining useful life and health state estimation of cutting tools. *Computers & Industrial Engineering 128*, 1008–1014.

Li, **Z**, **Fang**, **H**, **Huang**, **M**, **Wei**, **Y and Zhang**, **L** (2018) Data-driven bearing fault identification using improved hidden Markov model and self-organizing map. *Computers & Industrial Engineering 116*, 37–46.

Liao, **TW**, **Hua**, **G**, **Qu**, **J and Blau**, **PJ** (2006) Grinding Wheel Condition Monitoring with Hidden Markov Model-based Clustering Methods. *Machining Science & Technology: An International Journal 10*(4), 511–538.

Liao, **W**, **Li**, **D and Cui**, **S** (2016) A heuristic optimization algorithm for HMM based on SA and EM in machinery diagnosis. *Journal of Intelligent Manufacturing 29*(8), 1845–1857.

Mba, **CU**, **Makis**, **V**, **Marchesiello**, **S**, **Fasana**, **A and Garibaldi**, **L** (2018) Condition monitoring and state classification of gearboxes using stochastic resonance and hidden Markov models. *Measurement 126*, 76–95.

Nguyen, **N** (2017) An Analysis and Implementation of the Hidden Markov Model to Technology Stock Prediction. *Risks 5*(4), 62:1–62:18.

Oliveira, **W**, **Ambrósio**, **LM**, **Braga**, **R**, **Ströele**, **V**, **David**, **JM and Campos**, **F** (2017) A Framework for Provenance Analysis and Visualization. *Procedia Computer Science 108*, 1592–1601.

Padovano, **A**, **Longo**, **F**, **Nicoletti**, **L and Mirabelli**, **G** (2018) A Digital Twin based Service Oriented Application for a 4.0 Knowledge Navigation in the Smart Factory. *IFAC-PapersOnLine 51*(11), 631–636.

Qi, **Q**, **Tao**, **F**, **Zuo**, **Y and Zhao**, **D** (2018) Digital Twin Service towards Smart Manufacturing. *Procedia CIRP 72*, 237–242.

Ramos, **L** (2015) Semantic Web for manufacturing, trends and open issues: Toward a state of the art. *Computers & Industrial Engineering 90*, 444–460.

Talkhestani, **BA**, **Jazdi**, **N**, **Schloegl**, **W and Weyrich**, **M** (2018) Consistency check to synchronize the Digital Twin of manufacturing automation based on anchor points. *Procedia CIRP 72*, 159–164.

Ullah, **AMM S** (2019) Modeling and simulation of complex manufacturing phenomena using sensor signals from the perspective of Industry 4.0. *Advanced Engineering Informatics 39*(1), 1–13.

Xie, **F-Y**, **Hu**, **Y-M**, **Wu**, **B and Wang**, **Y** (2016) A generalized hidden Markov model and its applications in recognition of cutting states. *International Journal of Precision Engineering and Manufacturing 17*(11), 1471–1482.

Zhang, **S**, **Zhang**, **Y and Zhu**, **J** (2018) Residual life prediction based on dynamic weighted Markov model and particle filtering. *Journal of Intelligent Manufacturing 29*(4), 753–761.