Submission ID: **336**
22 September 2025

Dear Mari Väina & Olha Petrovych,

Thank you for giving us the opportunity to submit a revised draft of our short paper manuscript titled "**Applying Self-Organizing Maps (SOM) to PERMA+H Framework: Analysing Well-Being Expressions in Suomi24 Online Discussions**" for the post-proceeding of the 9th Digital Humanities in Nordic and Baltic Countries (DHNB) conference 2025. We appreciate the time and effort that you and the reviewers have dedicated to providing valuable feedback on our manuscript. We have studied the comments carefully and have incorporated changes to reflect most of the feedback which we hope will meet with approval. Please find a point-by-point response to the reviewers' comments and concerns below:

Reviewer #1

1. "Methodology section should describe dictionary construction in more detail (if space does not allow, it could be distributed in an online appendix). Knowledge about the dictionary and its contents are key for evaluating validity of the whole analysis."

Author Response: Thank you for your positive feedback and for recognizing the strengths of our manuscript. We agree with your assessment that a more detailed description of the dictionary is essential for readers to fully evaluate our analysis, which is why we have added more information in the manuscript as well as created an online appendix (https://github.com/mahdimunsi/PERMA-SOM/tree/main/DHNB2025/Dictionary) with the dictionary and the supplementary document.

Reviewer #2

1. "Self-Organizing Maps and K-means clustering are sensitive to hyperparameter choices, such as the number of iterations, grid size for SOM, and cluster count for K-means. The manuscript does not explain these choices or mention clustering quality metrics (e.g., silhouette score, gap statistics). In unsupervised settings, evaluating hyperparameters and conducting robustness checks across different random seeds is essential, as both algorithms can produce variable results and potentially misleading structures without these assessments.

It is difficult to determine the reliability of the results if these checks are not performed. It is possible to select a combination of parameters that supports any hypothesis; additionally, the observed structure might result from chance."

Author Response: First of all, thank you so much for such detailed feedback on the manuscript. It really helped us further develop the text. In the revised manuscript, we have expanded the Methods section to explain our choices for SOM parameters (grid size, training length, neighbourhood radius) and SOM quality metrics (Quantization Error, and Topographic Error).

2. "To create two-dimensional projections of the high-dimensional data, one can use various algorithms (some of them are less sensitive to the noise than others). I assume authors considered simpler methods such as Principal Component Analysis (PCA), UMAP, or Hierarchical Clustering. The authors do not motivate why self-organizing maps are the chosen approach. At this point, it seems that PCA+ K-means clustering could have provided the same output.
   I strongly recommend that the authors perform these checks and clearly report whether multiple dimensionality reduction methods yield consistent results, thereby strengthening the reliability of their findings."

Author Response: Our choice of Self-Organizing Maps was motivated by two primary reasons: **Visualization strength and interpretability** and **Exploratory flexibility**. Unlike methods that primarily optimize for variance (e.g., PCA) or probabilistic embeddings (e.g., t-SNE, UMAP), SOMs provide a stable, grid-based representation where different aspects of the data (data points, variables, densities) can be overlaid and inspected interactively. This makes SOMs particularly well suited for exploring messy, heterogeneous datasets where both global patterns (big clusters or trends) and localized variations (small patterns or trajectories) are of interest.

Our methodological choice is also supported by comparative studies showing that SOM often provides greater resolving power than PCA in detecting detailed or non-linear structures (e.g., Rousi et al. 2015; Astel et al. 2007; Das et al. 2016). Other research has suggested that PCA and SOM may also function complementarily (e.g., Gorgoglione et al. 2021; Ahmad et al. 2019), or that hybrid PCA-SOM approaches (applying PCA before feeding data into SOM) can enhance performance (Feng & Xu 2011). In future work, we intend to expand on these directions, but for now we emphasize SOM's unique contribution as a tool for exploratory and interpretable visualization in wellbeing informatics.

3. “Authors represent each document in terms of six dimensions (where each dimension is computed based on the frequencies of specific words). The natural question is, why didn’t authors embed the context of the forums using language models/approaches (e.g., TF-IDF, word2vec, or LLMs), since that would not limit them to only 600 words.”

Author Response: Our starting point in this project was deliberately selected to be simpler and more transparent. Our reasoning is that each step of the analysis should be directly visible and describable, allowing us to literally examine and interpret the process. Transparency is important for this initial stage of bridging theory with computational methods, and lexicon-based indicators aligning with theoretical framework allow such transparency compared to embeddings-based approach.

4. “The figure captions do not clearly explain what happens on the plots or convey the key takeaway message to the reader. Similarly, the Distance legend on the first and second figures is hard to interpret. What does the distance of 0.006 mean? How should we interpret it? Is it the distance between the documents belonging to the same neuron or between the neighbouring neurons?”

Author Response: Based on the reviewer feedback, we have now revised the figure captions to provide clearer explanations of what happens in the plots and how they should be interpreted and highlighted the key takeaway message for each figure.

5. “To substantiate your claim of identifying long-term patterns in wellbeing expressions, I urge you to expand on the evidence from additional subforums beyond the Arjaviente subforum. This will significantly reinforce your conclusions.”

Author Response: Thank you for this suggestion. We have expanded the analysis to include additional examples beyond the ones originally presented, while keeping within the constraints of the manuscript’s size limit.

Reviewer #3

1. “There is no direct hypothesis/thesis in the work. While I suppose this is fine in exploratory works, I think it makes it difficult to actually evaluate the work being done. It seems that the authors wanted to show that the tools they used might be applied to the problem of "how wellbeing is embedded and expressed in everyday

language". This seems vague. And the evaluation boils down to a handful of case studies."

Author Response: First of all, thank you so much for your comprehensive and constructive feedback on our manuscript as well as your encouragement towards the research efforts. We have carefully considered your comments, which have been instrumental in the substantive revision and refinement of the text; which also provided a foundation for a more objective and rigorous discussion of the future avenues for this research.

We agree that our work does not present a hypothesis in the traditional sense, and this was a deliberate choice, since our primary aim is exploratory: exploring an approach for operationalizing a social-psychological theory (PERMA+H) in terms of computational NLP methods that are transparent and interpretable — a lexicon-based approach and Self-Organizing Maps. Our guiding question is whether this combination of methods can meaningfully reveal patterns and long-term dynamics of wellbeing expressions in a large-scale forum dataset. The case studies presented are therefore not intended as full validation but as illustrative demonstrations of how this methodological approach can reveal both thematic zones and long-term shifts in wellbeing expression.

2. "I think the work could be grounded a bit better in related work. Authors discuss applications of SOM and PERMA-H, but perhaps there were similar studies done on the Suomi24 corpus? Or perhaps there were similar studies done on other corpora? It would also likely be easier to formulate the sections of related work if the specific problem was formulated better. Do other works also follow the 100-terms, lemmas way to encode features?"

Author Response: Based on the reviewer feedback, we have restructured our introduction section to separate the related works subsections. No similar study was conducted on the Suomi24 corpus prior to this research.

Regarding the "100 terms per dimension", this is not a standard approach but rather a practical starting point. In the absence of an existing Finnish PERMA+H lexicon, this design choice allowed us to have a working dictionary, which was then refined with human (expert) validation.

3. "Are there any limitations when it comes to encoding features by calculating rate of the hand-picked (and generated) 100 lemmas?"

Author Response: Yes, lexicon-based feature extraction comes with inherent limitations; it cannot capture contextual nuances and implicit meanings, which we have now mentioned in the conclusion section.

4. “What about stochastic aspect of the ML processes? If the authors were to repeat the research, could we draw the same conclusions?”
   “What if we used a different grid?”

Author Response: In the revised manuscript, we have expanded the Methods section to address the stochastic aspect of this unsupervised learning method, where we explain our choices for SOM parameters (grid size, training length, neighbourhood radius) and SOM quality metrics (Quantization Error, and Topographic Error).

5. “what model was used?
   what prompts were used?
   did the authors stay at default model settings or did they modify sampling parameters such as e.g. temperature?”

Author Response: We have added information in the manuscript specifying the model name and clarified that we used the default settings.

6. “> Suomi24 is hierarchically structured into over 20 top-level subforums
   > 432 aggregated units across 20 years

   If I understand right, the authors group all the discussions by year and by their top-level forum. But given 20 years and 20 top-level forums, this gives 400 buckets. Where do the extra 32 come from?”

Author Response: In addition to the 20 original top-level subforums, several new subforums were introduced in later years, and posts without a designated subforum were automatically assigned to an “unknown” category for each year. This explains why the total exceeds 400. We have corrected the manuscript to state that the corpus consists of 20–23 top-level subforums across the 20-year period.

7. “Initial wordlists (100 terms per category) were generated using large language model prompting and then refined by a Finnish-speaking expert on positive

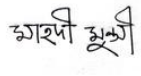
psychology and the PERMA+H framework to ensure cultural and theoretical alignment.

- How did the expert refine the LLM's choices?
- What exactly in those terms needed refinement?
- How was cultural and theoretical alignment ensured?
- Why was cultural alignment needed?
- Why 100 terms per category? Would 50 be insufficient? Would 200 be too much? I suppose it was not purely arbitrary choice, perhaps authors (or the expert) experimented with those settings and they found that there's extra value when moving from 50 to 100, or that too much noise is being introduced when going to 100 to 200. In each case, it would be great to learn about these. Otherwise it might be difficult to extrapolate the value of this work to other research. Perhaps in different dataset or language the same motivation would lead to 50 terms?"

Author Response: Thank you for these insightful questions. To address them in detail, we have prepared a supplementary document (online appendix) that explains the refinement process, criteria for cultural and theoretical alignment, and the rationale behind selecting 100 terms per category. The document is available in the supplementary folder of our repository: https://github.com/mahdimunsi/PERMA-SOM/tree/main/DHNB2025/Dictionary.

We sincerely thank the reviewers and the editorial team for their constructive and insightful feedback, which has helped us significantly strengthen the manuscript. We have carefully addressed the comments and revised the text accordingly, adding clarifications, supplementary documentation, and expanded analyses where needed. We believe these revisions have improved both the validity and clarity of the work. We hope the revised manuscript now meets the standards for publication, and we look forward to the possibility of sharing our findings with the conference journal's readership.

Sincerely,



Mahdi Munshi
22 Sep. 25

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