MTSI Dashboard Evaluation

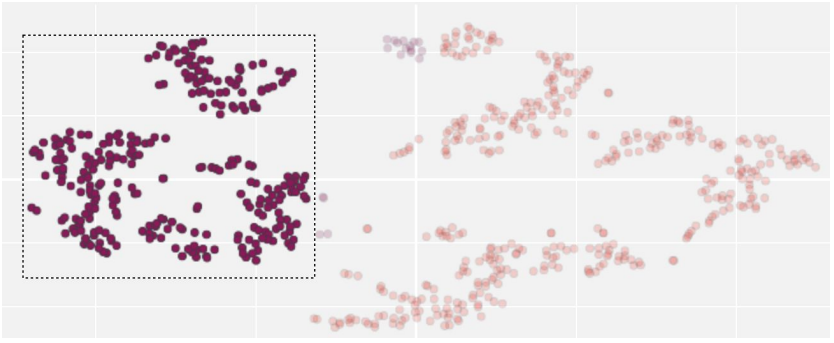
Name: Angelos Chatzimparmpas
Position: PhD Student in Information Visualization and Visual Analytics
Affiliation: Linnaeus University, Sweden
E-mail: angelos.chatzimparmpas@lnu.se

Main Evaluation

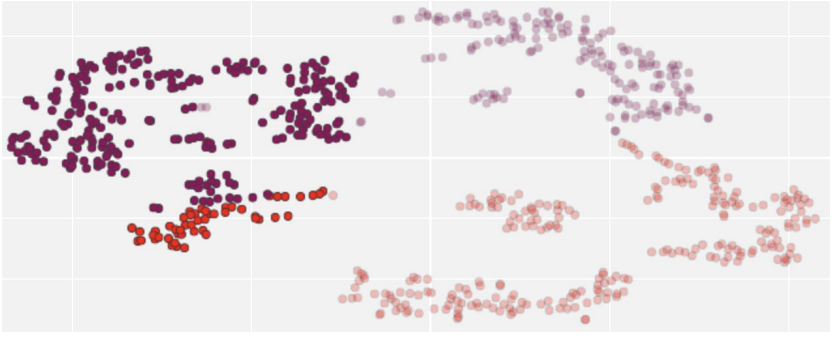
1. Crash Errors

I faced no crash errors but there are logical flaws/errors in your visual analytics tool. Check the individual cases below.

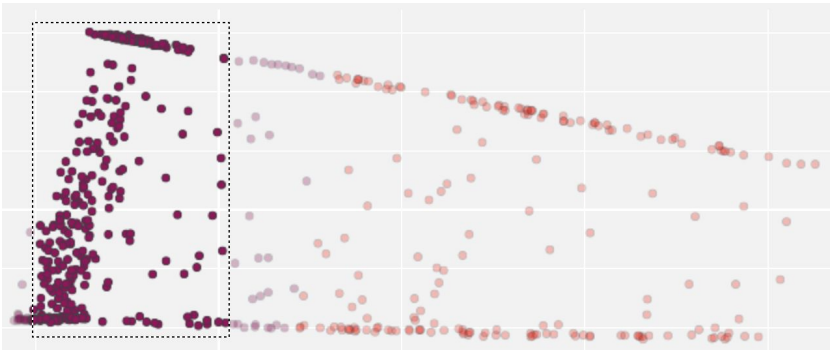
I select an area



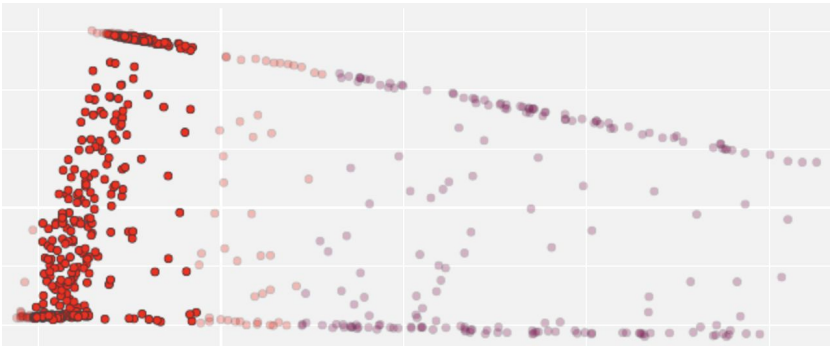
and then the projection updates. This is a problem of initializing t-SNE with a specific random seed. Moreover, the color-encoding appears wrong. There might be an issue with the points' IDs. This error causes the same points to retrieve completely diverse colors, right?



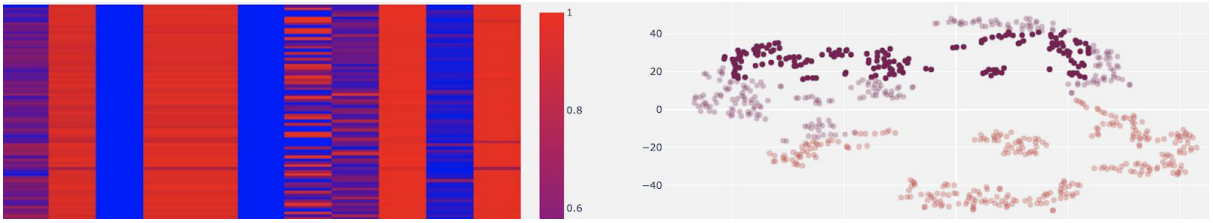
I select in the PCA the following points (shown in dark red)



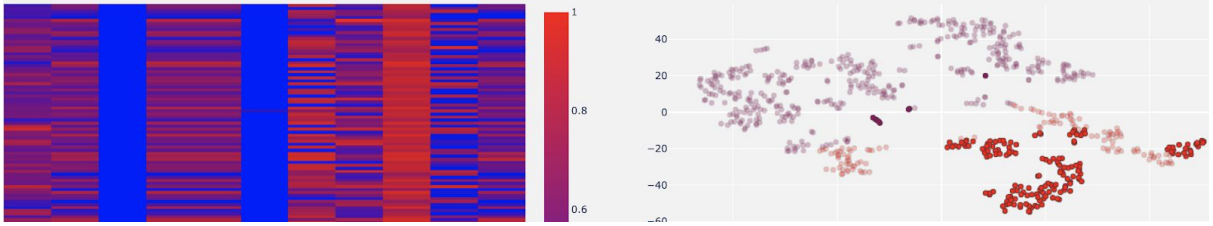
and they become light red. Exactly the opposite color as they should. Something is wrong here with the code used for coloring the points, right? Similar to the previous problem.



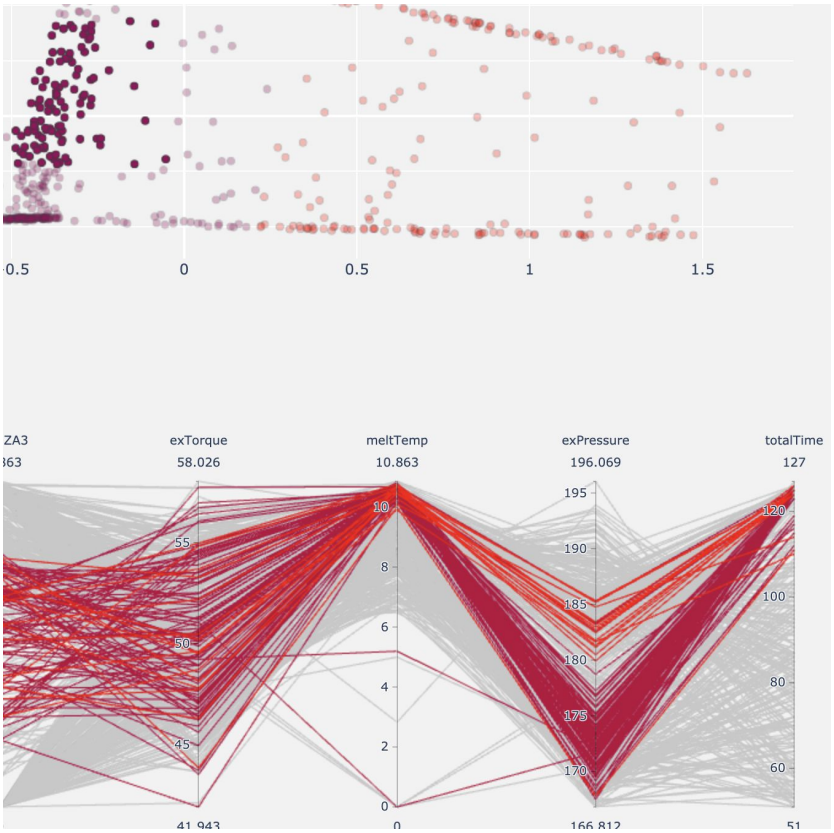
I select an area of dark points only. However, in the Heatmap most values appear light red.



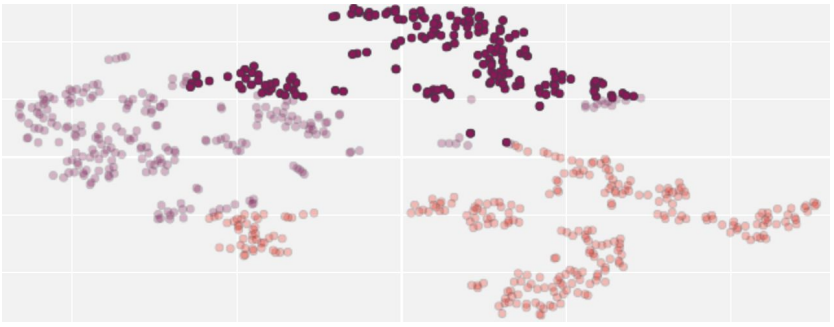
When I do the opposite and select light-red regions, I observe mostly dark red (and blue) values in the Heatmap. Why? Should this work as explained here or should the color be reversed in the Heatmap?



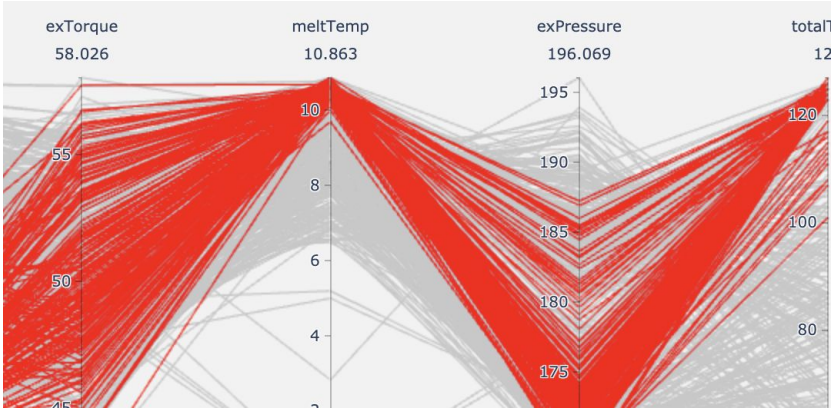
I pick dark-red points in the PCA plot and I see light-red values in the parallel coordinates plot (PCP). This is also problematic.



This happens also with the t-SNE projection. Dark points' selection leads to



light points exploration in the PCP. There is probably a bug in your code. Consider taking a deeper look.



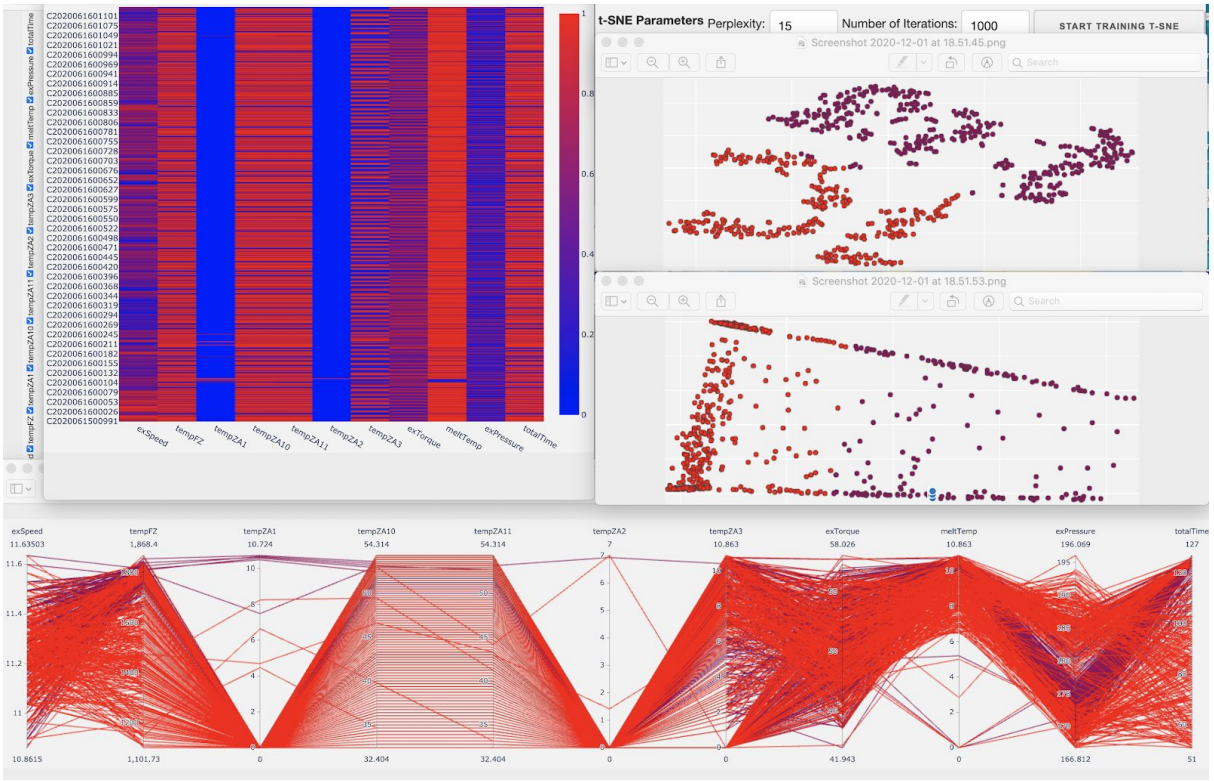
2. System Functions Unexpectedly.

- **t-SNE** plot always updates when I select a bunch of points. You should use a random seed to stop the projection from changing while I simply select a number of points.
- Changing **t-SNE's** parameters did not work for me.
- Additionally, when I picked **specific features to plot** still nothing happened.
- I would expect to remove all selections (i.e., reset) in the **PCP** when I double click anywhere else other than a specific axis.
- When I choose particular ranges in the **PCP**, why **t-SNE** and **PCA** views are not updated? Each interaction in the three views should filter the data in all the other visualizations. Am I wrong?
- I guess you use the same legend everywhere. I am yet not sure what is 0 or 1 in your use case but I found some **strange effects**, in the previous section.

Post Evaluation

- The **t-SNE** projection and **PCA** plot should not contain any axes. There is no meaning in those axes that both plots have currently.
- I would make the **t-SNE** and **PCA** plots square (e.g., 480px width and 480px height for each one of them). It is better this way because the user is reassured that there is no distortion imminent in the projection's space he/she views.
- "303 points are Selected from TSNE" out of? It would be better to say: "**303/350 points** from t-SNE".
- Activate **lasso selection** as the default for both embeddings.
- **Remove from all the interaction panels**: zoom, box select, autoscale, toggle spike lines, show closest data on hover (this should be the default either way), and compare data on hover. But for the Heatmap, you can keep the "toggle spike lines".
- What is the meaning of the **legend in the Heatmap view**? Please, add a vertical title for this particular legend.
- When the user **hovers over the Heatmap** he/she expects the following:
    - Sensor: C200…
    - Feature: exPressure
    - Value: ≈0.014 (limit this value to 3-4 digits?)
- For the remaining visual representations (t-SNE and PCA plots), I advise you to use: "Sensor: C200…" **without the (x, y) pairs** which are misleading (while performing **on hover** actions).
- Try to **fit all the views in one window** of a typical laptop screen. Align the views in order to have some sort of symmetry. Scrolling is bad, thus, reduce the empty space in your tool and fit everything (all views) in one window. Responsiveness would have been good if implemented but it is not necessary.
- Where is the title for the **PCP**? I suppose it should have been Parallel Coordinates Plot.
- In the **Heatmap** view, the sensors should have been sorted according to their serial number (or at least in some other way).

- What is the meaning behind the **title**: “Cluster Graphs for Cycles”? Is it truly cluster graphs or dimensionality reduction plots in most cases? Maybe it is better to say something more general such as “Visualization of Machine Cycles”.
- Why does someone need the “PLOT TSNE” **button**? If it is being retrained then you simply update the projection when the process finishes.
- For the same reason, why does someone need the “PLOT FEATURES” **button**? The user can check or uncheck the features based on his/her liking. Next, the Heatmap updates instantly.
- You do not have to say the value of **perplexity** and **iteration** since I have already set up those values above in the two modifiable fields you present to the user.
- I would **align** the titles to the top-center from the top-left side of each visualization.
- This kind of message: “5 points selected in the Parallel Coordinates Plot. tempZA3: [3.4002609293784603, 5.804454813885717] is the range of selection.” is really nice. However, it should be **placed somewhere in the middle**. Possibly above the PCP and below the Heatmap and PCA plot.
- I am not sure if a blue to red diverging **color scale** is the optimal solution for your views. Maybe a single hue color would have been better since your values range from 0 to 1 and NOT from -1 to 1. Check https://colorbrewer2.org/ for advice.
- See below my suggestion for an **improved layout**. It is a collage of screenshots.



Comments: t-SNE parameters are related only to t-SNE’s projection, thus, they should be located precisely above it. There is no need for extra details in the title of t-SNE’s embedding except for “t-SNE projection/plot/embedding”. The t-SNE and PCA plots could be better if they have the same dimensions (and square format). The features on the left-hand side are relevant for the Heatmap view and the PCP from what I understand. Hence, you can place them where they currently are being illustrated in the aforementioned figure. However, a horizontal orientation instead of vertical (as they are depicted here) could be preferable.