Deep Learning based Approach to Cancer Classification

A. Goals:

Apply deep learning techniques to metabolite based cancer classification. Identify important metabolites for cancer classification.

B. Brief Description:

Deep Belief Networks were applied to metabolite profile data to classify cancer stages. A set of 260 metabolites was analyzed for 7 type T2 and 7 type T3 samples.

C. Heights of Achievements this semester:

- Found metabolites that accurately predict type T2 and T3 cancer stages.
- It was found that putrescine alone or combinations of other top ranking metabolites are good predictors for stage T2 and T3 cancer.
- Produced a ranking of 260 metabolites based on sensitivity analysis.

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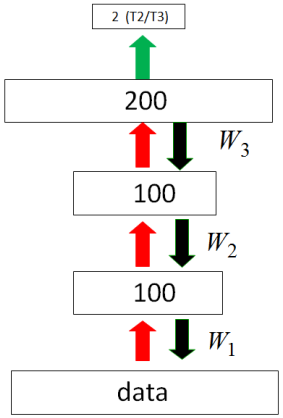
The classification model

- Linear unit input layer
- 2 Output nodes (one for each class)
- Each layer extras "causes" of previous layer
- 14 input data vectors of 260 metabolite profiles, each 7 from class T2 and 7 from class T3.



Metabolite Ranking

- Top 20 metabolites for classification of T2/T3 cancer:

1. putrescine
2. pyroglutamine*
3. maltotetraose
4. acetylcholine
5. cis-aconitate
6. N-acetylputrescine
7. spermine
8. 1-methylnicotinamide
9. ribitol
10. Xanthine
11. 5,6-dihydrouracil
12. N-acetylaspartate (NAA)
13. alpha-tocopherol
14. 2-hydroxypalmitate
15. hydroxyisovaleroyl carnitine
16. Isovalerylcarnitine
17. Sphingosine
18. sebacate (decanedioate)
19. 1-palmitoleoylglycerophosphocholine*
20. 2-hydroxystearate

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