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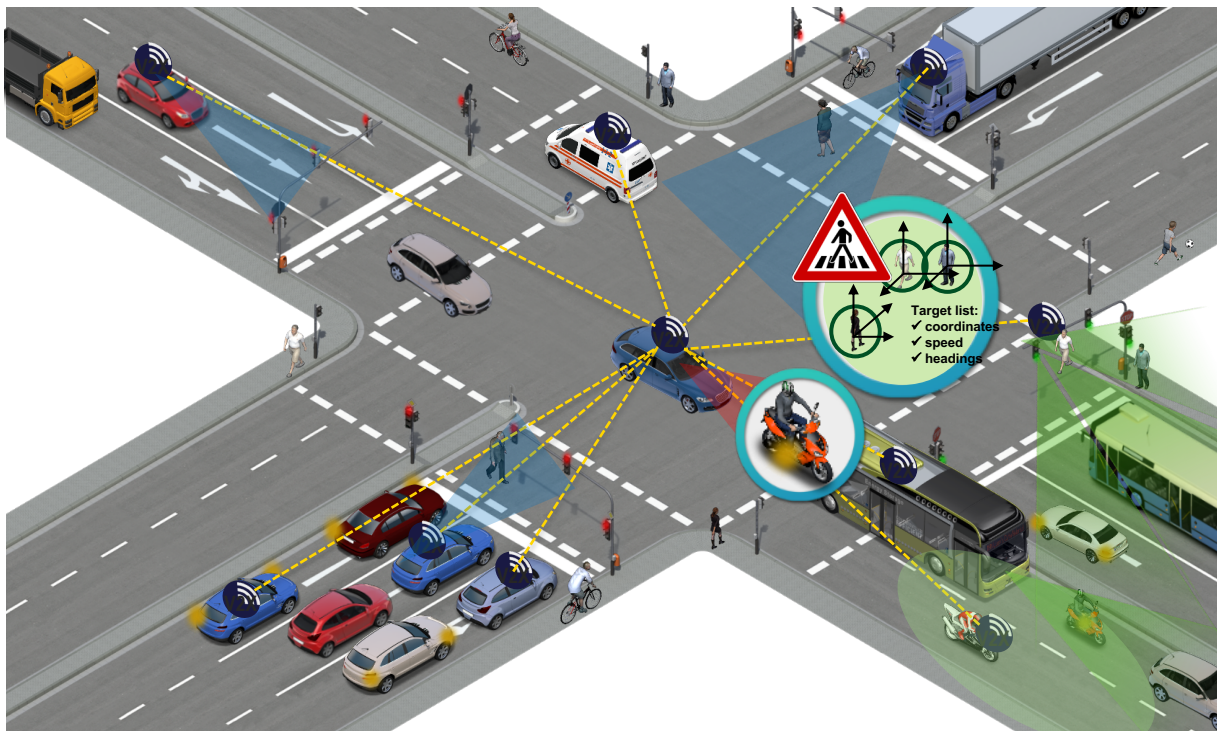


# Collective Perception, optimization of the V2X frequency channel(s) usage and CP message contents based on A.I.

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# V2X – what does it do?



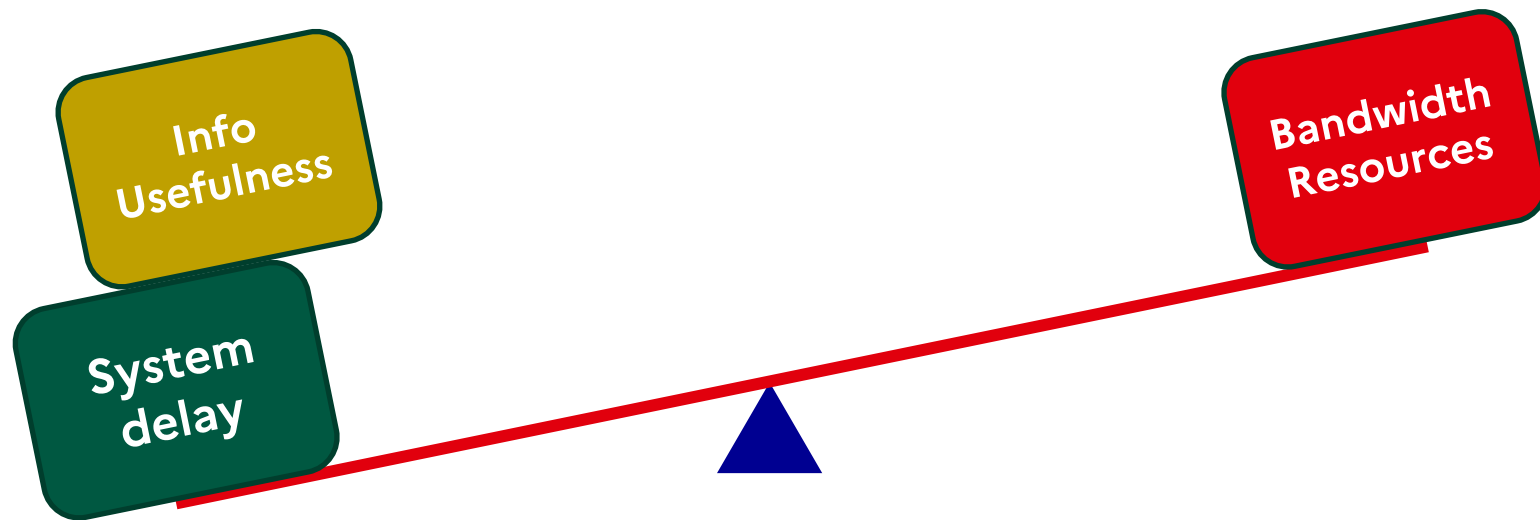
# What is the problem?

Little Jack can observe 10 surrounding road objects  
Jack tells everyone what he sees every 1/10 seconds  
100 little Jacks can observe 1000 road objects  
That translates to **10,000** messages per second!

**No one can withstand that amount of demand!**  
**Compression to the rescue!**

# That's easy. Compressing data is like a 50 years problem.

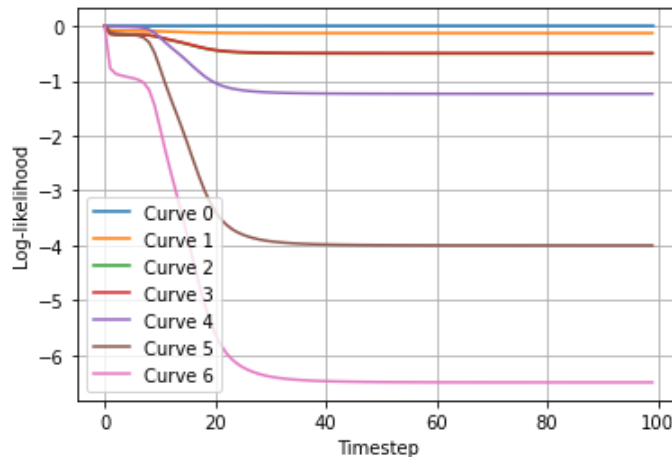
I wish it was that easy too :(



# Why we don't talk about Bruno

If Bruno is just as normal as other people, why should we talk about him?

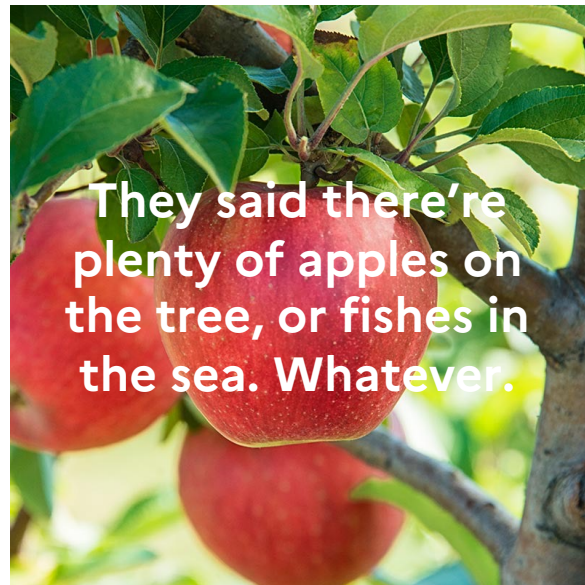
- Driving behaviors that require attention are usually unusual, not frequently encountered on the road.
- This problem is essentially anomaly detection. We discovered that Bayes factor is also useful for designing an anomalous behaviour detector that has minimal delay [1].



# An altruist with a few bad apples

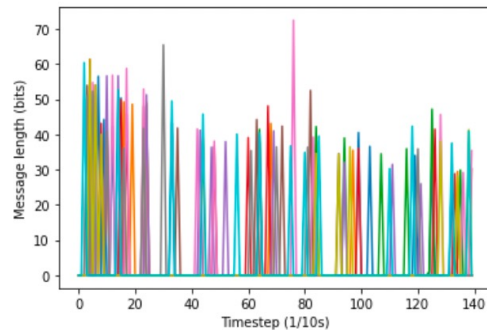
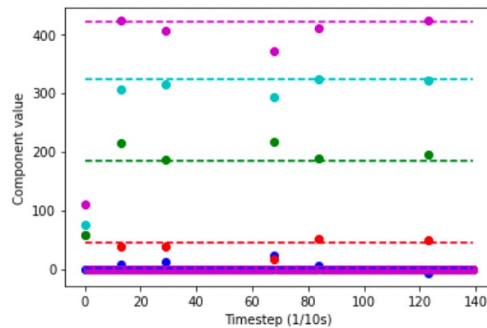
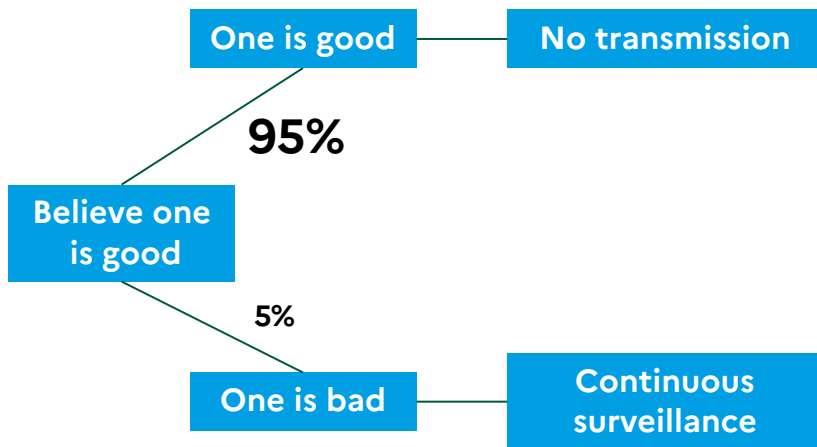
## Opportunistic Compression

- A few people will drive like maniacs, but most of 'em won't (fortunately).
- An altruistic algorithm will believe everyone will behave rightfully, and give out a prediction about a trajectory that is most likely seen on the road.
- This prediction is also known in advance by the recipients.
- It will refine its prediction as it observes the road object for a longer period of time. It will make corrections on its initial prediction with time.



**Inspirational quote that inspired  
the algorithm**

# An altruist with a few bad apples



# Publications

- [1] D. T. Hoang, V. Martinez, D. Delahaye, “Online Detection of Anomalous Driving Behavior by Bayes Factor,” *IEEE Transactions on Intelligent Transportation Systems*, 2021 (submitted).
- [2] D. T. Hoang, V. Martinez, D. Delahaye, “Online Detection of Anomalous Driving Behavior by Bayes Factor,” *IEEE Vehicular Networking Conference (VNC)*, 2021.
- [3] D. T. Hoang, V. Martinez, D. Delahaye, P. Maréchal, “Spherical Coding for V2X Collective Perception Data Compression: A Pilot Study,” 25th IEEE International Conference on Intelligent Transportation Systems (*ITSC*), 2022 (in submission).





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Thank you\*

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\* Also a pop hit from Diana Ross