Visualization of Supernovae Classification

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Outline

1. Introduction
2. Getting the information
    a. Tension as an uncertainty measure
    b. Making the csv file
3. Visualizing changes through time
4. Demo
5. Future Work

Introduction: Why Visualization?

- Vision is the most important channel for receiving information from our environment

FIgure 1: Scientific visualization, using data from a computer simulation. It shows a Supernova 1987A. *Credits: NASA, ESA, and F. Summers and G. Bacon (STScI); Simulation Credit: S. Orlando (INAF-Osservatorio Astronomico di Palermo)*

Introduction: Why Visualization?

- It’s hard for humans detect patterns from numbers

	id_sn	time	RA	DECL	MWEBV	REDSHIFT FINAL	g	r	i	z	g_e	r_e	i_e	z_e	SIM REDSHIFT	class
0	393133	1.10850	34.5	-5.5	0.0227	0.695	36.7300	8.8670	-16.9800	-1.8180	30.750	3.599	7.060	2.926	0.7001	2
1	393133	2.09000	34.5	-5.5	0.0227	0.695	-5.3990	0.4444	6.1790	3.0800	9.315	3.863	6.318	2.922	0.7001	2
2	393133	3.10750	34.5	-5.5	0.0227	0.695	0.6672	4.0030	-0.3458	-0.5002	7.694	2.655	4.790	3.017	0.7001	2
3	393133	7.13700	34.5	-5.5	0.0227	0.695	6.9330	-3.9910	1.7490	-2.4030	3.789	1.758	3.200	2.936	0.7001	2
4	393133	8.15075	34.5	-5.5	0.0227	0.695	0.4684	-2.3700	0.3952	2.4730	2.000	1.875	2.783	3.190	0.7001	2

- We need to translate these measures in order to show it clearly

Presentation and Exploratory Graphics

- Presentation graphics are static. They’re useful for presenting summaries of information

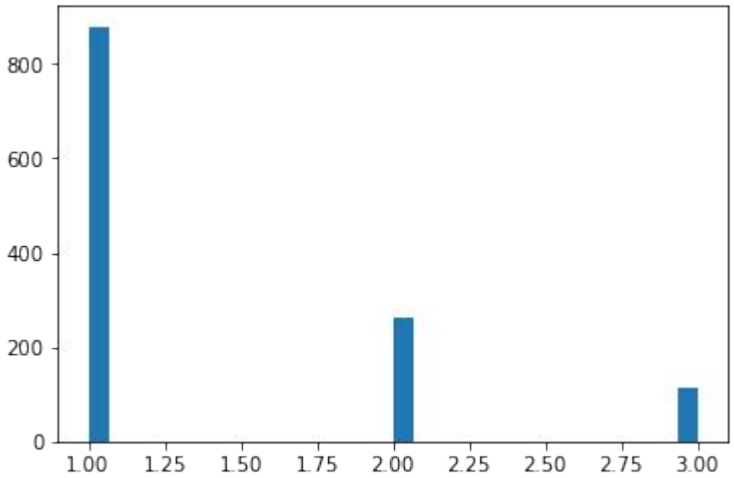
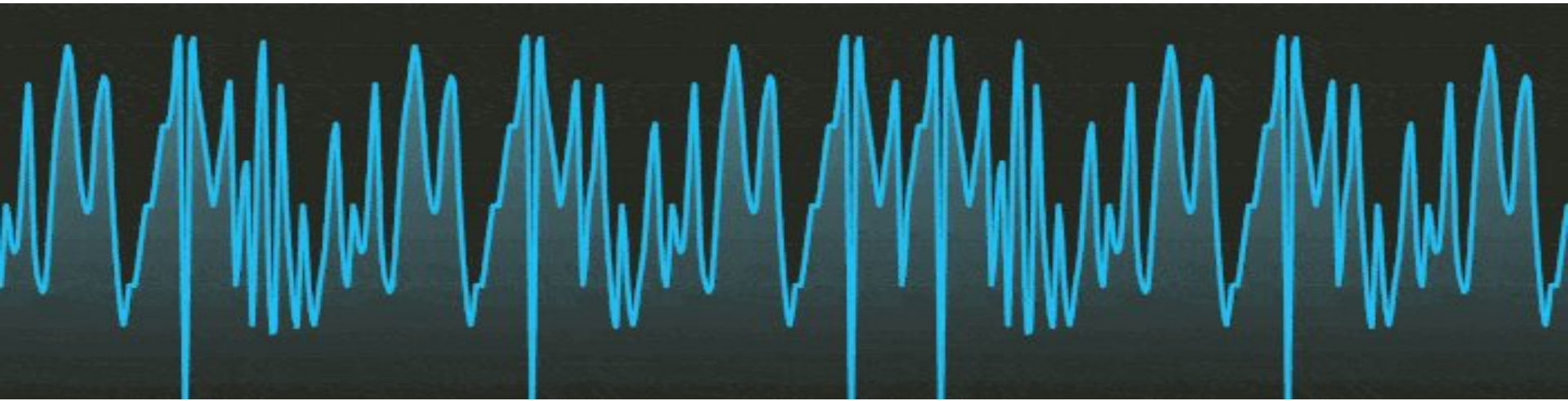


Figure 2: Histogram of supernovae sorted by type

Chen, C. H., Härdle, W. K., & Unwin, A. (Eds.). (2007). *Handbook of data visualization*. Springer Science & Business Media.

Presentation and Exploratory Graphics

- Exploratory graphs are used to look for results. In the context of supernovae classification, they have to show us changes through time



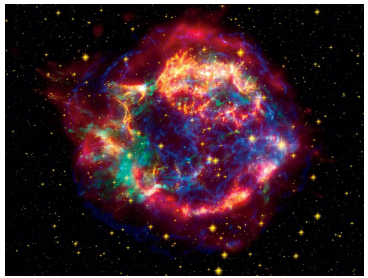
Chen, C. H., Härdle, W. K., & Unwin, A. (Eds.). (2007). *Handbook of data visualization*. Springer Science & Business Media.

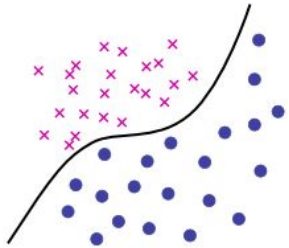
The problem

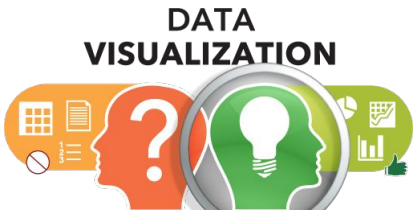
We want to explore the results from an online classification of supernovae. In order to do this, we have to visualize:

1. **Probability of type classification** for each supernova
2. **Tension** between classes
3. Global information

Online Classification





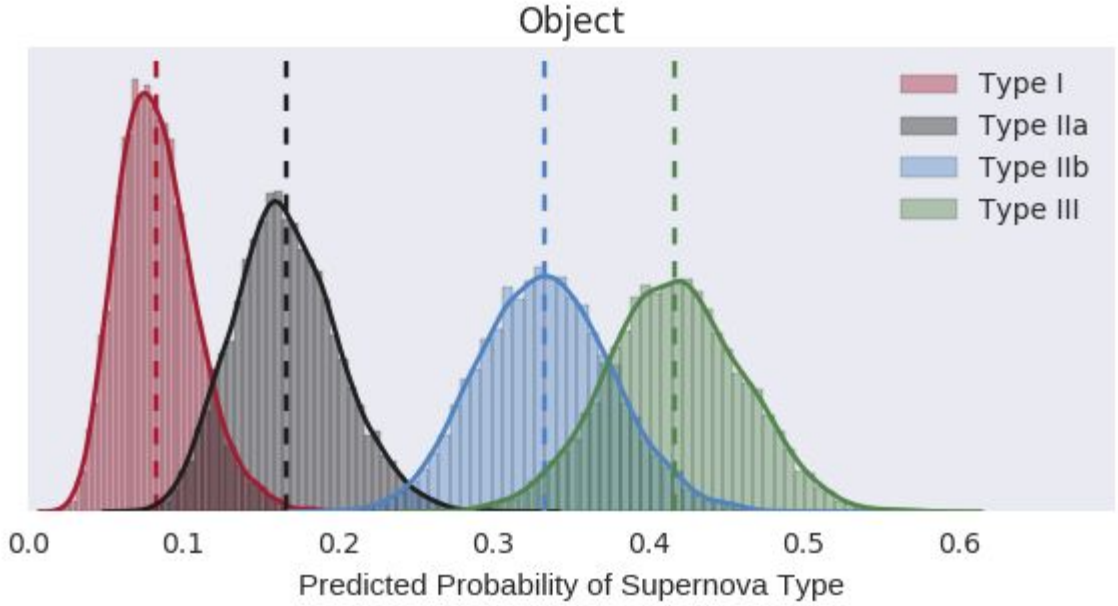


We receive information from the universe via observations at each time step

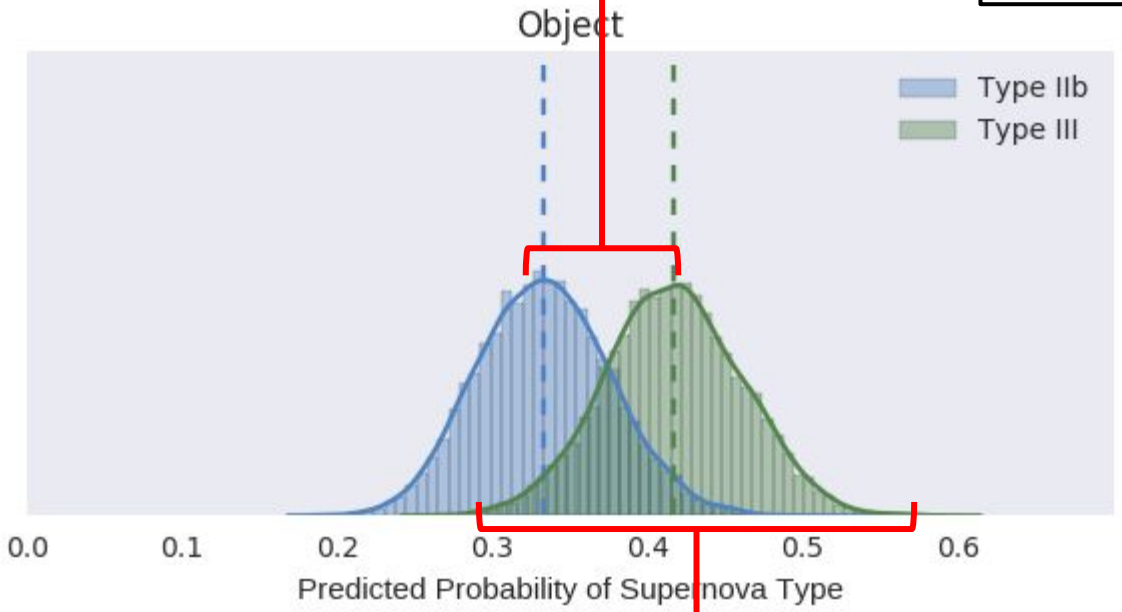
We train a model & make classifications

We want to visualize the process & results

Motivating Tension



Motivating Tension

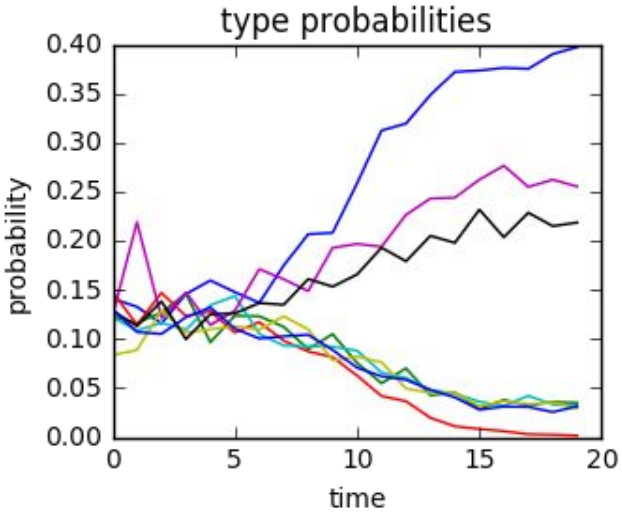


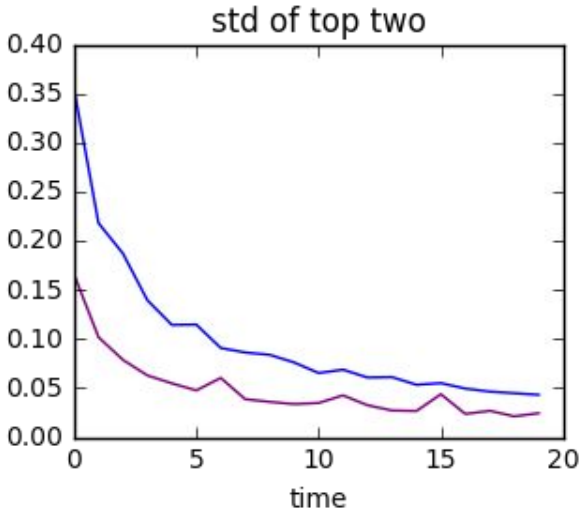
Spread

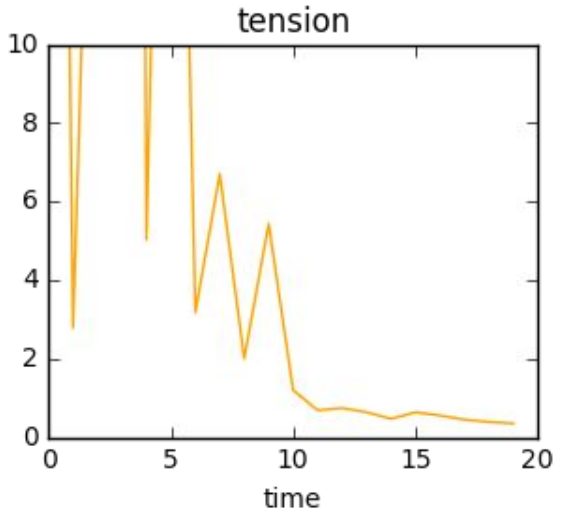
$$\frac{|P1 - P2|}{\sqrt{\sigma_1^2 + \sigma_2^2}}$$

Distribution “fatness”

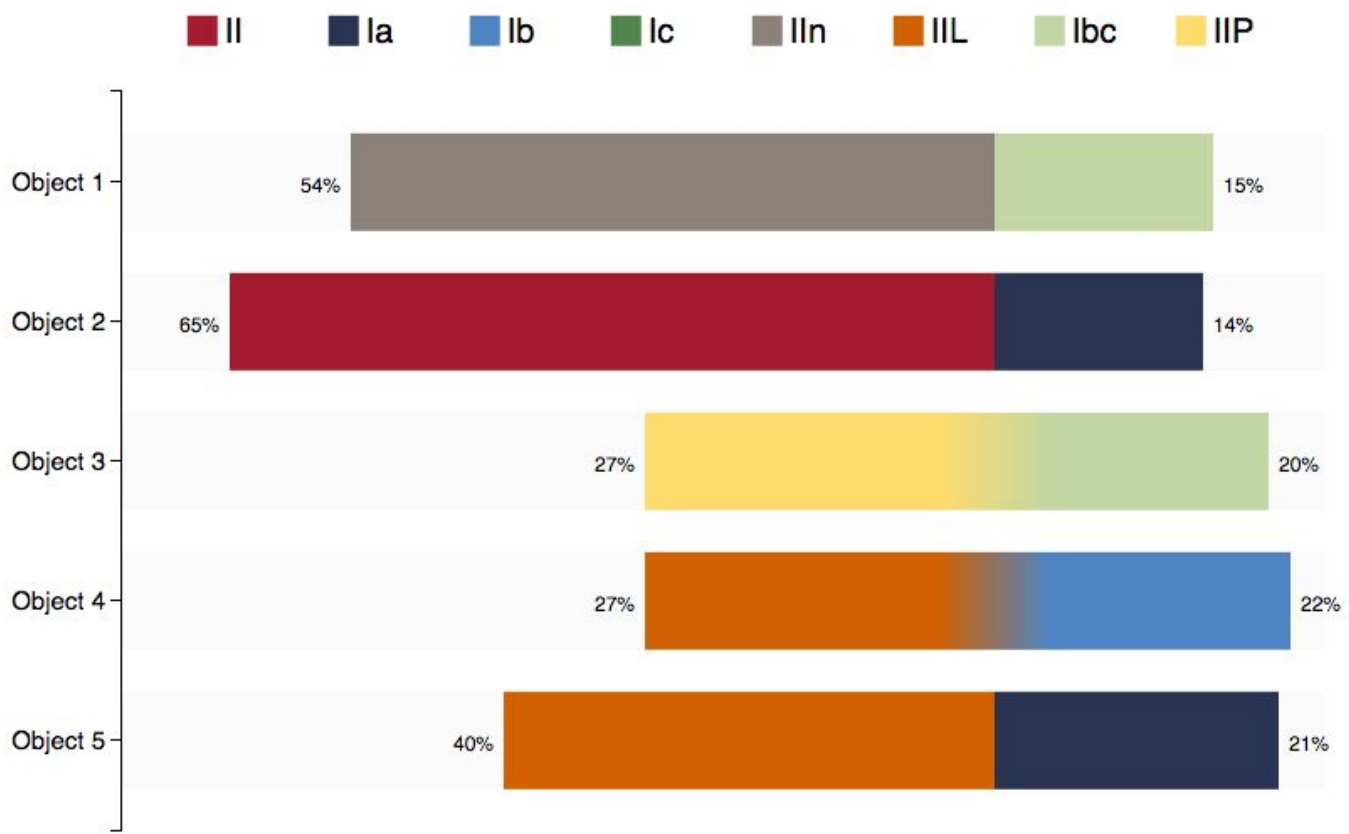
Simulating Online Predictions







Our Visualization



Future Work

- Time Elapse
- Online Feedback - Have we achieved classification yet? If not, should we keep observing?
- Visualize thousands of objects at different levels of granularity
- Accessibility for color blindness