A Latent Growth Analysis of Repeated Measures Blood Pressure Data

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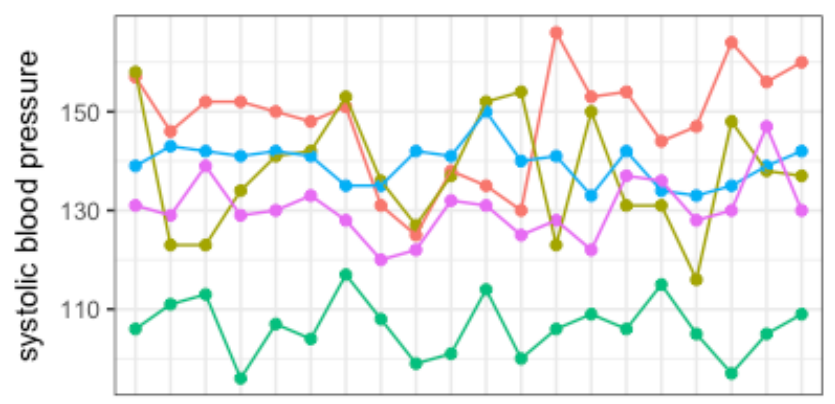
Ambulatory Blood Pressure Monitoring

- Uncontrolled hypertension leads to heart attacks and strokes!
- White coat “hypertension” is common
- Ambulatory monitoring: record BP at regular intervals over 24 hours
- Gold standard!

The Masked Hypertension Study



- 663 subjects, 20 BP measurements each
- Hypertensive if **systolic BP > 135 mm**

87 (13%) of subjects have hypertension

Covariate	Summary
Smokers	59 (8.9%)
Coffee drinkers	544 (82.1%)
Activity level	9 (0, 2972)
Heart Rate	77 (47, 107)
Blood Pressure	123 (70, 203)

Growth mixture models (GMM)

- Potential clusters in the blood pressure profiles
- 1, 2, 3, 4 classes with fixed time covariates (heart rate, smoker, coffeedrinker)
- BIC, class size, slope trajectory plot

Time-varying covariate

- Activity level : intensity of activity of each subject right before each measurement was taken

- Determine whether the same number of classes would be extracted

Results

- Selected by assessing the BIC value and the proportion of subjects assigned to a given class
- Model 2: better empirical fit to the data
- Four-class model: undesirable class size for the first and third latent classes (0% of subjects were assigned)

Model	**BIC Value**
One-Class	96966.218
Two-Class	96958.627
Three-Class	96965.652
Four-Class	96997.590

One Class and Two Class Model

	One Class Model (K=1)	Two Class Model (K=2)	
	Latent Class 1	*Latent Class 1*	*Latent Class 2*
Mean Slope (S), p-value	-0.003, 0.000	-0.003, 0.001	0.004, 0.185
Mean Intercept (I), p-value	124.476, 0.000	122.977, 0.000	136.883, 0.000
Proportion in Each Class	100%	91.53%	8.47%
Bayesian (BIC)	96966.218	96958.627	

Three Class Model

	Three Class Model (K=3)		
	Latent Class 1	*Latent Class 2*	*Latent Class 3*
Mean Slope (S), p-value	-0.002, 0.011	-0.021, 0.000	0.005, 0.182
Mean Intercept (I), p-value	121.920, 0.000	141.964, 0.000	137.051, 0.000
Proportion in Each Class	88.81%	4.09%	7.11%
Bayesian (BIC)	96965.652		

Summary of the Two Class Model

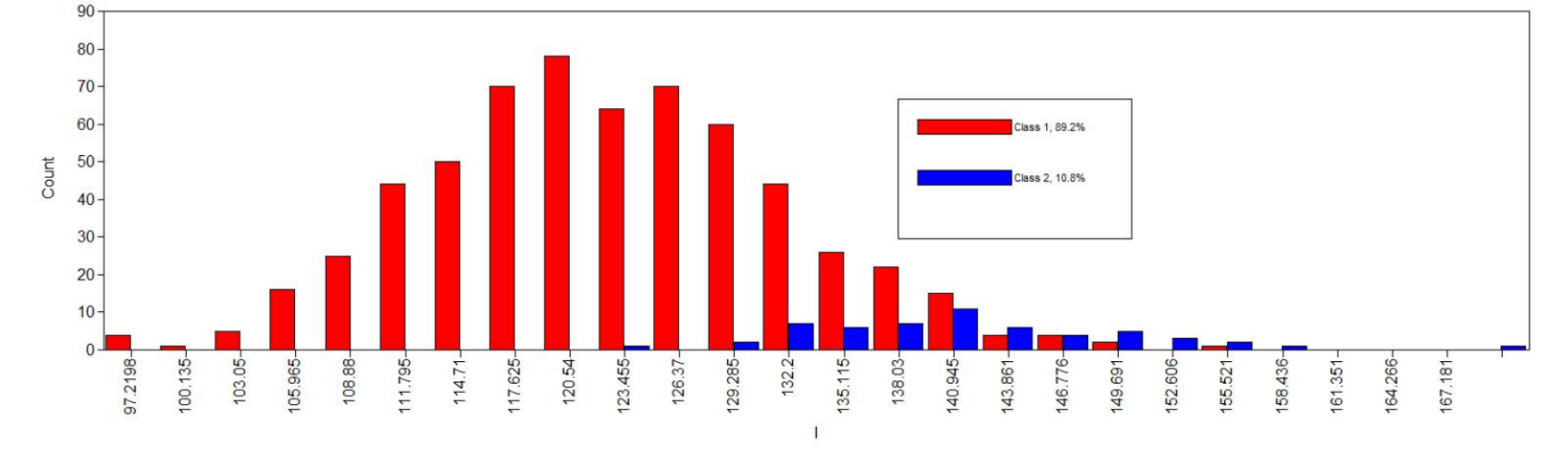
- Subjects can be best categorized into two latent classes:
  - Low and high blood pressure groups
- Majority in the first latent class (low blood pressure group): 91.53%
- Remaining in the second latent class (high blood pressure group): 8.47%

Mean Slope (S), p-value
Mean Intercept (I), p-value

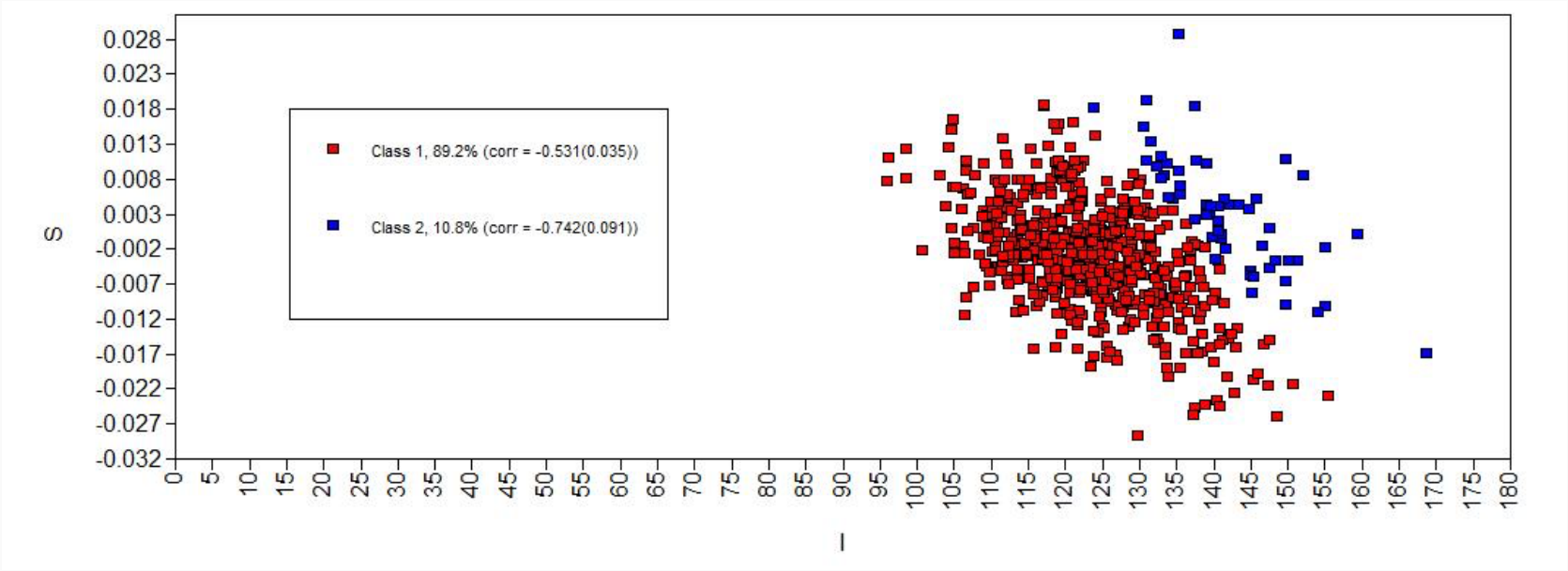
Latent Class 1	*Latent Class 2*
-0.003, 0.001	0.004, 0.185
122.977, 0.000	136.883, 0.000

Slopes are nearly identical

Subject-specific intercepts for 2-class model



Slopes and Intercepts for 2-class model



Time-varying covariate

	Two Class Model (K=2)	
	Latent Class 1	*Latent Class 2*
Mean Slope (S), p-value	0.000, -------	0.010, -------
Mean Intercept (I), p-value	100.846, -------	125.793, -------
Proportion in Each Class	90.00%	10.00%
Bayesian (BIC)	-------	

Conclusions, and thanks for listening!

- Primary analysis (without activity time varying covariate)
  - Selected from one, two, three, and four-class latent growth curve models
- Chose two-class model based on BIC
- Analysis of the different classes:
  - Subjects were divided into classes based on the magnitude of their random slopes and intercepts