Leveraging Machine Learning to Study How Temperament Scores Predict Pre-Term Birth Status

The material contained herein is supplementary to the article named in the title and submitted to the journal, Early Human Development

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This supplemental appendix provides machine learning analyses, figures and tables in support of the following manuscript: "Leveraging Machine Learning to Study How Temperament Scores Predict Pre-Term Birth Status", submitted to Early Human Development.

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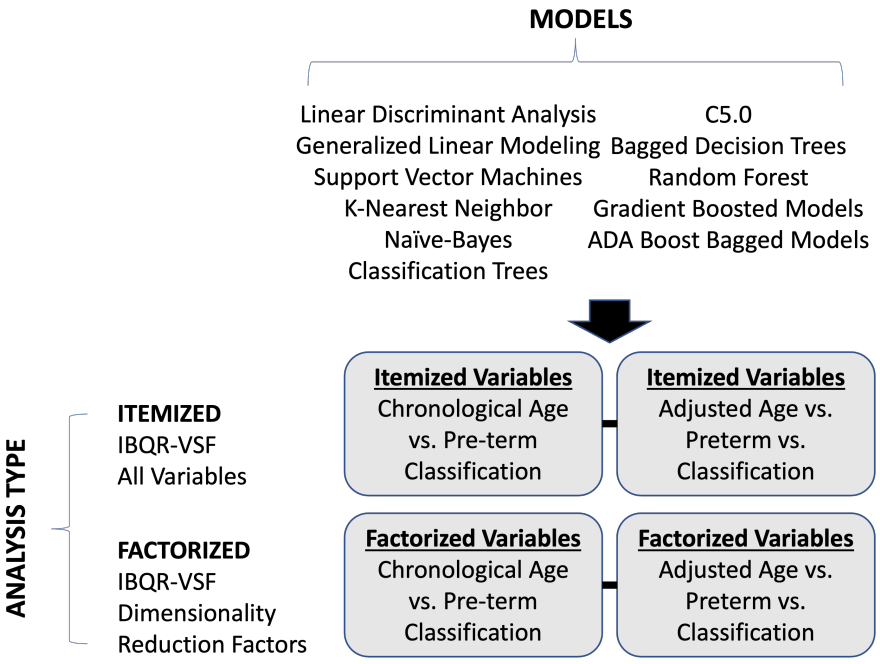

Figure S 1: Modeling Methodology.

Table S 1: Infant Behavior Questionnaire-Revised Very Short Form Items - Surgency

Surgency
Item 1: When being dressed or undressed during the last week, how often did the baby squirm and/or try to roll away?
Item 2: When tossed around playfully how often did the baby laugh?
Item 7: How often during the week did your baby move quickly toward new objects?
Item 8: When put into the bath water, how often did the baby laugh?
Item 13: When placed on his/her back, how often did the baby squirm and/or turn body?
Item 14: During a peekaboo game, how often did the baby laugh?
Item 15: How often does the infant look up from playing when the telephone rings?
Item 20: When visiting a new place, how often did your baby get excited about exploring new surroundings?
Item 21: How often during the last week did the baby smile or laugh when given a toy?
Item 26: When hair was washed, how often did the baby vocalize?
Item 27: How often did your baby notice the sound of an airplane passing overhead?
Item 36: How often did your baby make talking sounds when riding in a car?
Item 37: When placed in an infant seat or car seat, how often did the baby squirm and turn body?

Table S 2: Infant Behavior Questionnaire-Revised Very Short Form Items - Negative Affect

Negative Affect
Item 3: When tired, how often did your baby show distress?
Item 4: When introduced to an unfamiliar adult, how often did the baby cling to a parent?
Item 9: When it was time for bed or a nap and your baby did not want to go, how often did s/he whimper or sob?
Item 10: After sleeping, how often did the baby cry if someone doesn't come within a few minutes?
Item 16: How often did the baby seem angry (crying and fussing) when you left her/him in the crib?
Item 17: How often during the last week did the baby startle at a sudden change in body position (e.g., when moved suddenly)?
Item 22: At the end of an exciting day, how often did your baby become tearful?
Item 23: How often during the last week did the baby protest being placed in a confining place (infant seat, play pen, car seat, etc.)?
Item 28: When introduced to an unfamiliar adult, how often did the baby refuse to go to the unfamiliar person?
Item 29: When you were busy with another activity, and your baby was not able to get your attention, how often did s/he cry?
Item 32: When the baby wanted something, how often did s/he become upset when s/he could not get what s/he wanted?
Item 33: When in the presence of several unfamiliar adults, how often did the baby cling to a parent?

Table S 3: Infant Behavior Questionnaire-Revised Very Short Form Items - Effortful Control

Effortful Control
Item 5: How often during the last week did the baby enjoy being read to?
Item 6: How often during the last week did the baby play with one toy or object for 5-10 minutes?
Item 11: In the last week, while being fed in your lap, how often did the baby seem eager to get away as soon as the feeding was over?
Item 12: When singing or talking to your baby, how often did s/he soothe immediately?
Item 18: How often during the last week did the baby enjoy hearing the sound of words, as in nursery rhymes?
Item 19: How often during the last week did the baby look at pictures in books and/or magazines for 5 minutes or longer at a time?
Item 24: When being held, in the last week, did your baby seem to enjoy him/herself?
Item 25: When showing the baby something to look at, how often did s/he soothe immediately?
Item 30: How often during the last week did the baby enjoy gentle rhythmic activities, such as rocking or swaying?
Item 31: How often during the last week did the baby stare at a mobile, crib bumper or picture for 5 minutes or longer?
Item 34: When rocked or hugged, in the last week, did your baby seem to enjoy him/herself?
Item 35: When patting or gently rubbing some part of the baby's body, how often did s/he soothe immediately?

Table S 4: Sample Descriptions

Researcher(s)	Sample Group	Sample Size (n)	Chronological Infant Age (weeks)	Adjusted Infant Age (weeks)	Gender (% male)	Race (% non-white)	Sample Description
Keim	Sample 1	121	48.00-72.00	40.00-64.00	52.1	32.2	Sample of preterm infants
Leerkes	Sample 1	Preterm:8	24.43-62.71	21.00-58.00	50.0	62.5	Community sample of infants born to primiparous mothers
	Sample 1	Full-term:113	51.71-71.71		46.9	51.3	Community sample of infants born to primiparous mothers
Rennels	Sample 1	Preterm:23	27.57-46.14	22.43-42.00	47.8	56.5	Community sample of infants
	Sample 1	Full-term:32	25.00-56.57		56.3	40.6	Community sample of infants
	Sample 2	Full-term:7	26.00-28.14		42.9	42.9	Community sample of full-term infants
Narvaez	Sample 1	48	48.00-67.00		56.3	25.0	Community sample of full-term infants
Sanborn & Bisson	Sample 1	Preterm:18	10.29-60.71	4.29-56.71	61.1	Not Collected	Community sample of infants
	Sample 1	Full-term:35	6.14-63.14		53.8	Not Collected	Community sample of infants
Dunkel Schetter & Coussons-Read	Sample 1	Preterm:8	25.14-57.00	20.14-53.00	62.5	87.5	Community sample of infants
	Sample 1	Full-term:35	51.29-63.71		53.1	51.4	Community sample of infants
Tarullo	Sample 1	31	44.20-56.20		61.3	22.6	Community sample of full-term, healthy infants
Schoppe-Sullivan	Sample 1	30	34.00-51.00		50.0	6.6	Community sample of infants born to primiparous mothers
Thomason	Sample 1	Preterm:12	24.07-33.27	13.39-30.13	75.0	83.3	Infants born to high-risk mothers from low socioeconomic backgrounds
	Sample 1	Full-term:8	28.27-30.38		25.0	75.0	Infants born to high-risk mothers from low socioeconomic backgrounds
Braungart-Rieker	Sample 1	19	21.19-32.09		57.9	26.3	Community sample of full-term infants without any developmental delays
Lumeng	Sample 1	15	17.14-24.00		46.7	26.7	Community sample of full-term, healthy infants
Lenze	Sample 1	Preterm:4	27.00-30.00	23.00-26.00	75.0	100.0	Infants born to mothers with prenatal depression
	Sample 1	Full-term:9	52.00-69.00		55.6	77.8	Infants born to mothers with prenatal depression
Christian	Sample 1	Preterm:2	8.00	4.00-4.29	50.0	50.0	Sample of infants born to mothers with low-risk pregnancy (e.g., no major health problems, singleton pregnancy)
	Sample 1	Full-term:4	8.00		50.0	50.0	Sample of infants born to mothers with low-risk pregnancy (e.g., no major health problems, singleton pregnancy)
	Sample 2	Preterm:2	12.00-16.00	8.43-12.57	50.0	0.00	Sample of infants born to mothers with low-risk pregnancy (e.g., no major health problems, singleton pregnancy)
	Sample 2	Full-term:7	12.00-24.00		25.0	50.0	Sample of infants born to mothers with low-risk pregnancy (e.g., no major health problems, singleton pregnancy)
Saxbe	Sample 1	Preterm:1	28.51	25.36	0.00	0.00	Community sample of infants born to primiparous mothers
	Sample 1	Full-term:10	13.52-33.09		70.0	20.0	Community sample of infants born to primiparous mothers
Stroud	Sample 1	Preterm:2	9.61-11.97	3.32-6.69	50.0	100.0	Community sample of infants oversampled for mothers who smoked cigarettes during pregnancy
	Sample 1	Full-term:4	3.44-4.03		50.0	50.0	Community sample of infants oversampled for mothers who smoked cigarettes during pregnancy
Rodriguez	Sample 1	5	24.00		60.0	40.0	Full-term infants born to primiparous mothers with elevated sociodemographic risk
Anzman-Frasca	Sample 1	2	10.57-16.43		100.0	50.0	Community sample of full-term infants born to primiparous mothers

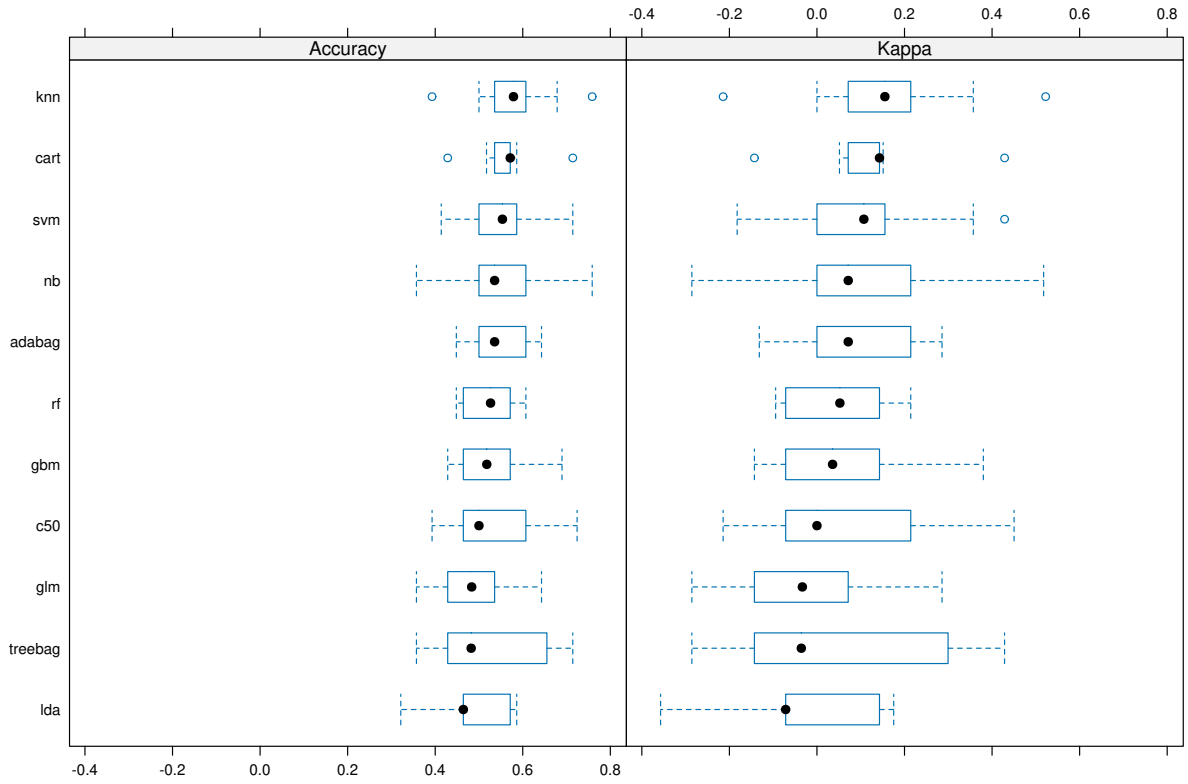

Figure S 2: Accuracy Estimates: Chronological Age Group vs. Pre-Term Group - Itemized Variables.

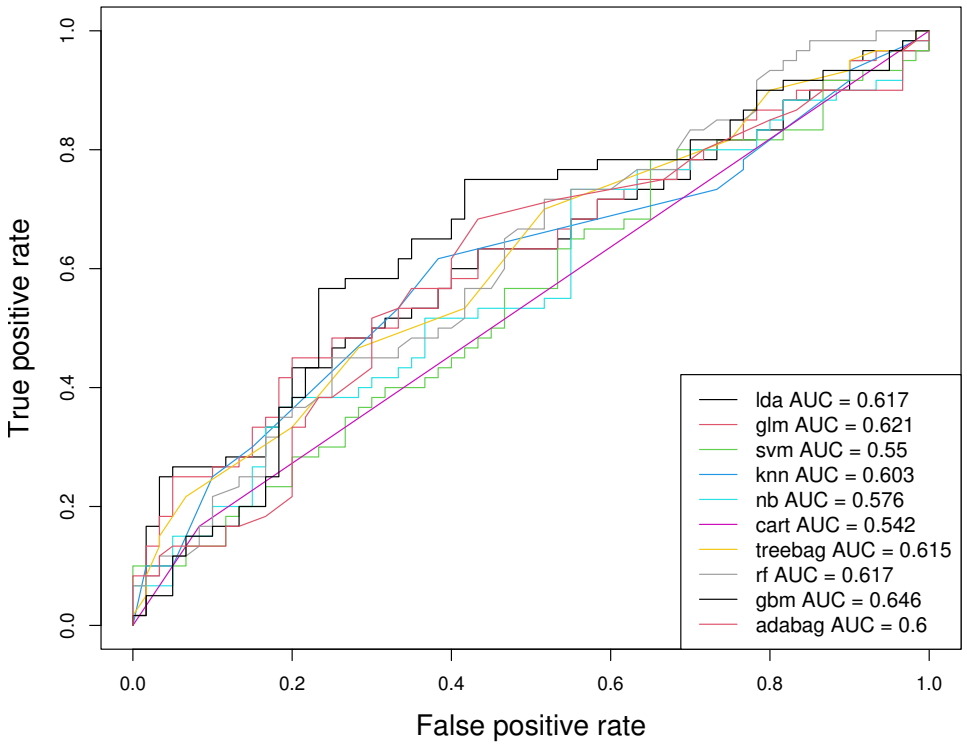

Figure S 3: Receiver Operator Curve: Chronological Age Group vs. Pre-Term Group - Itemized Variables.

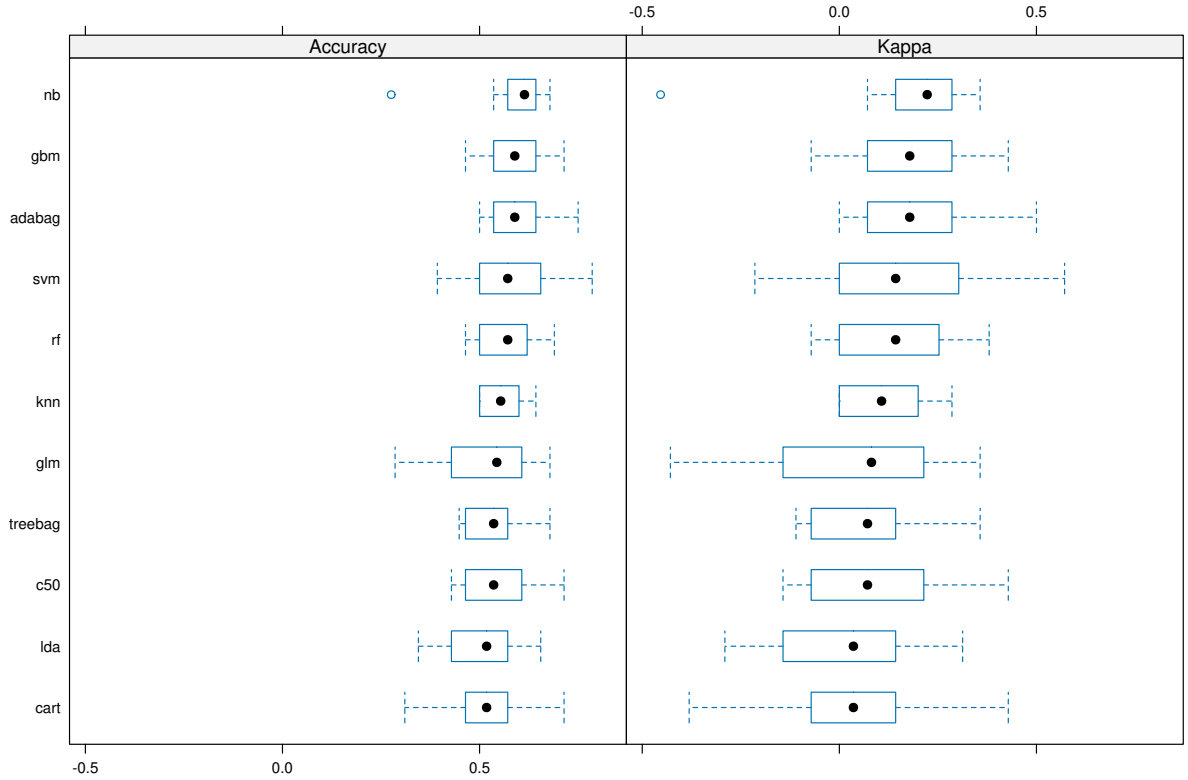

Figure S 4: Accuracy Estimates: Age Adjusted Group vs. Pre-Term Group - Itemized Variables.

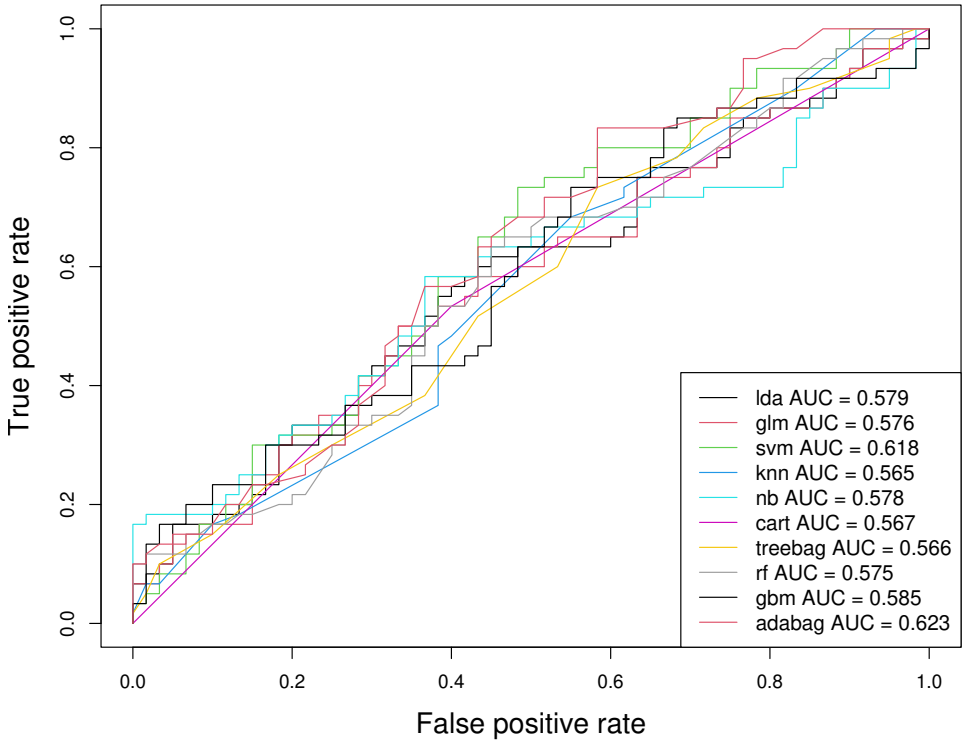

Figure S 5: Receiver Operator Curve: Age Adjusted Group vs. Pre-Term Group - Itemized Variables.

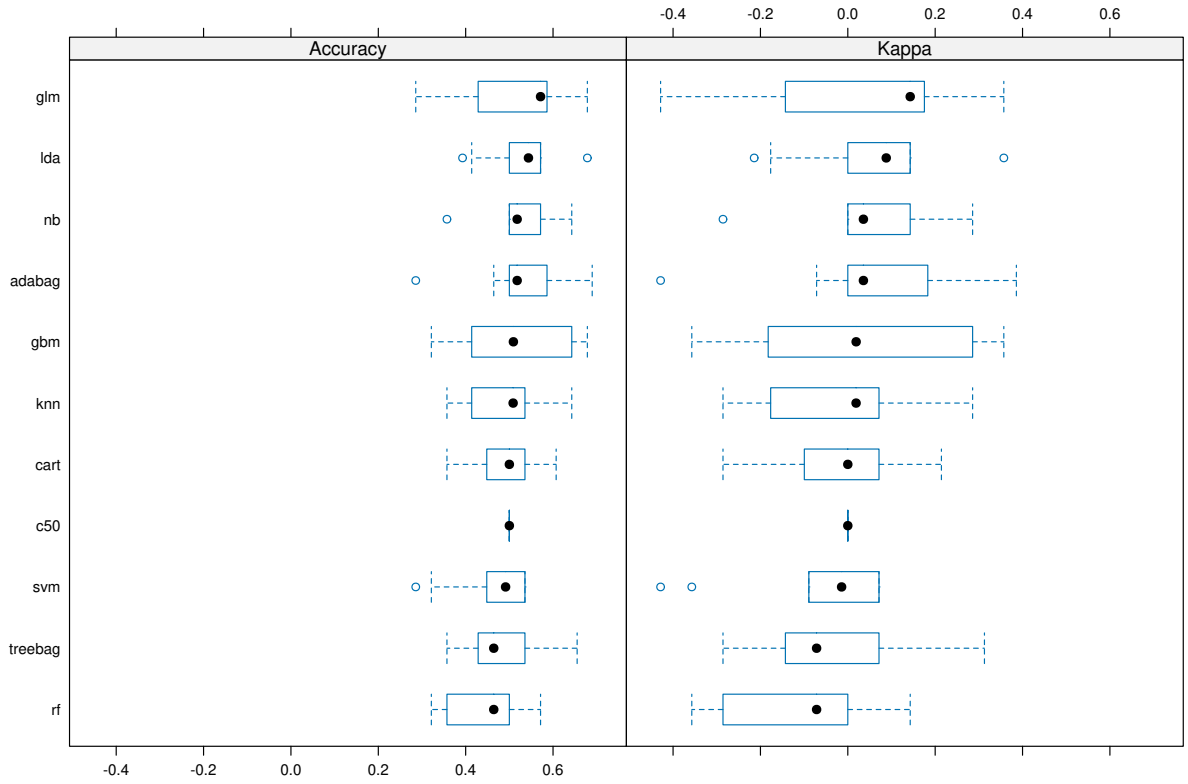

Figure S 6: Accuracy Estimates: Chronological Age Group vs. Pre-Term Group - Factorized Variables.

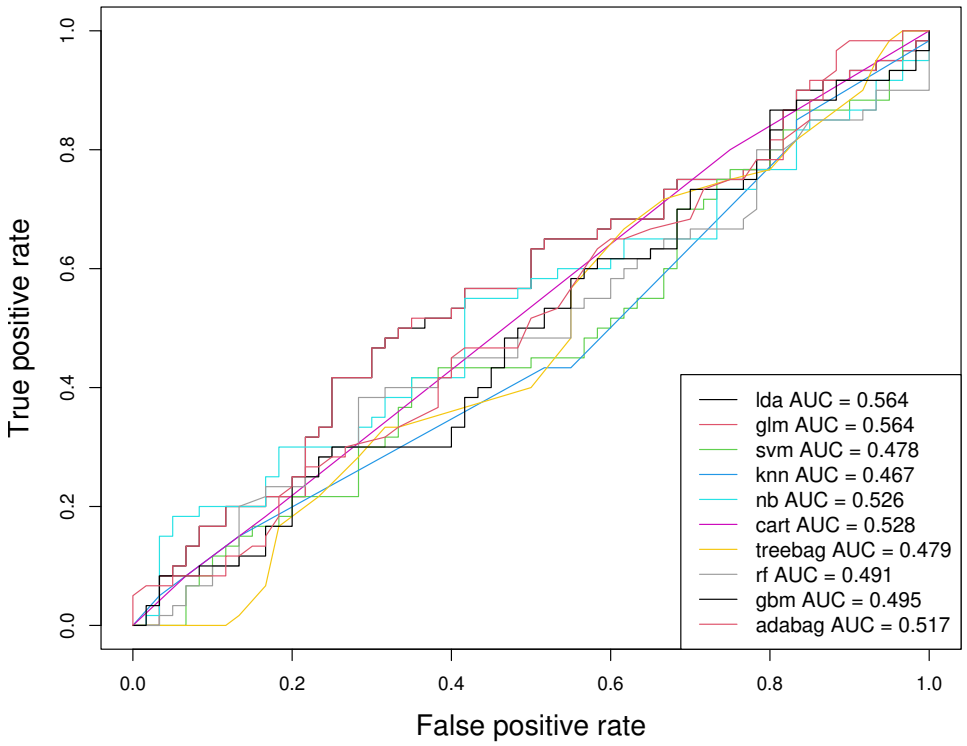

Figure S 7: Receiver Operator Curve: Chronological Age Group vs. Pre-Term Group - Factorized Variables.

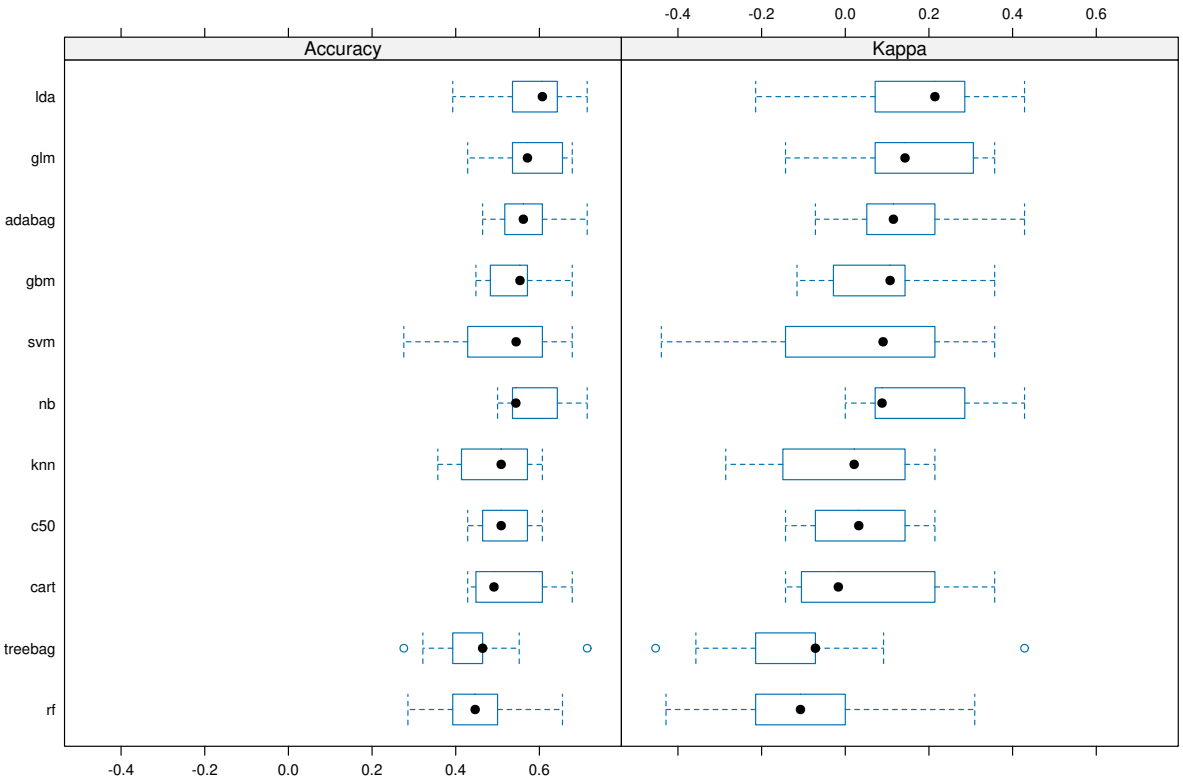

Figure S 8: Accuracy Estimates: Age Adjusted Group vs. Pre-Term Group - Factorized Variables.

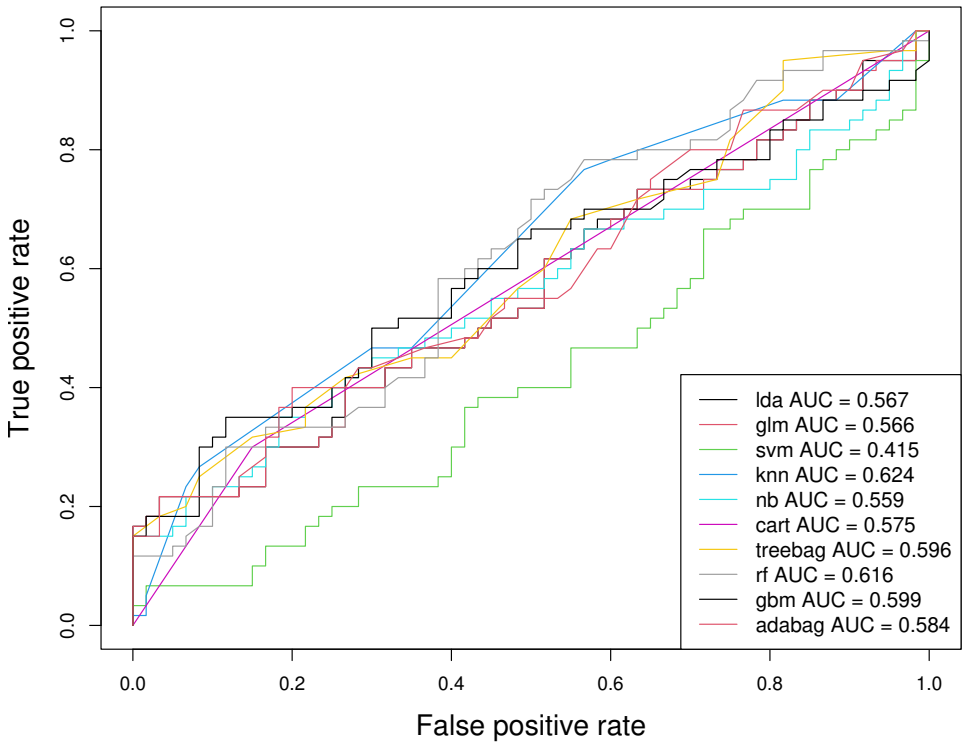

Figure S 9: Receiver Operator Curve: Age Adjusted Group vs. Pre-Term Group - Factorized Variables.

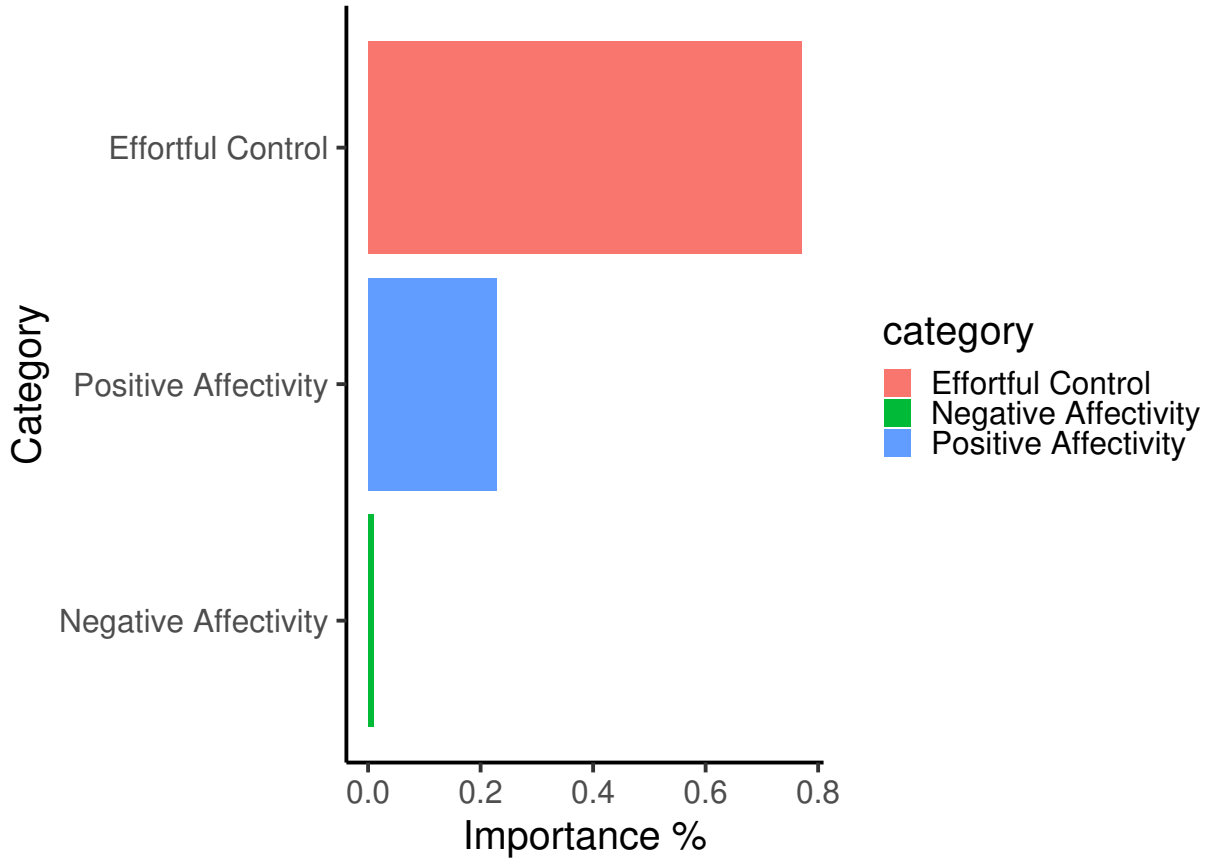

Figure S 10: Feature Importance: Chronological Age Group vs. Pre-Term Group - Factorized Variables

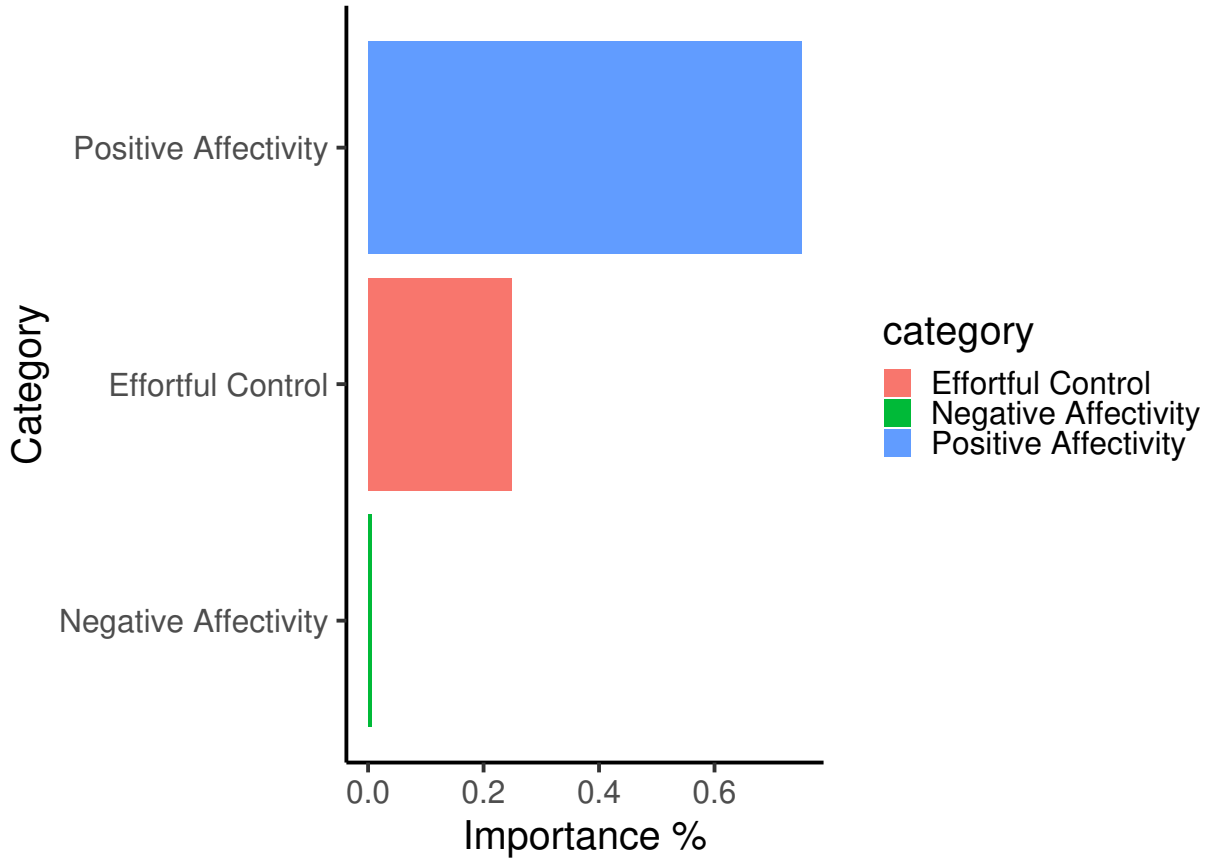

Figure S 11: Feature Importance: Age Adjusted Group vs. Pre-Term Group - Factorized Variables

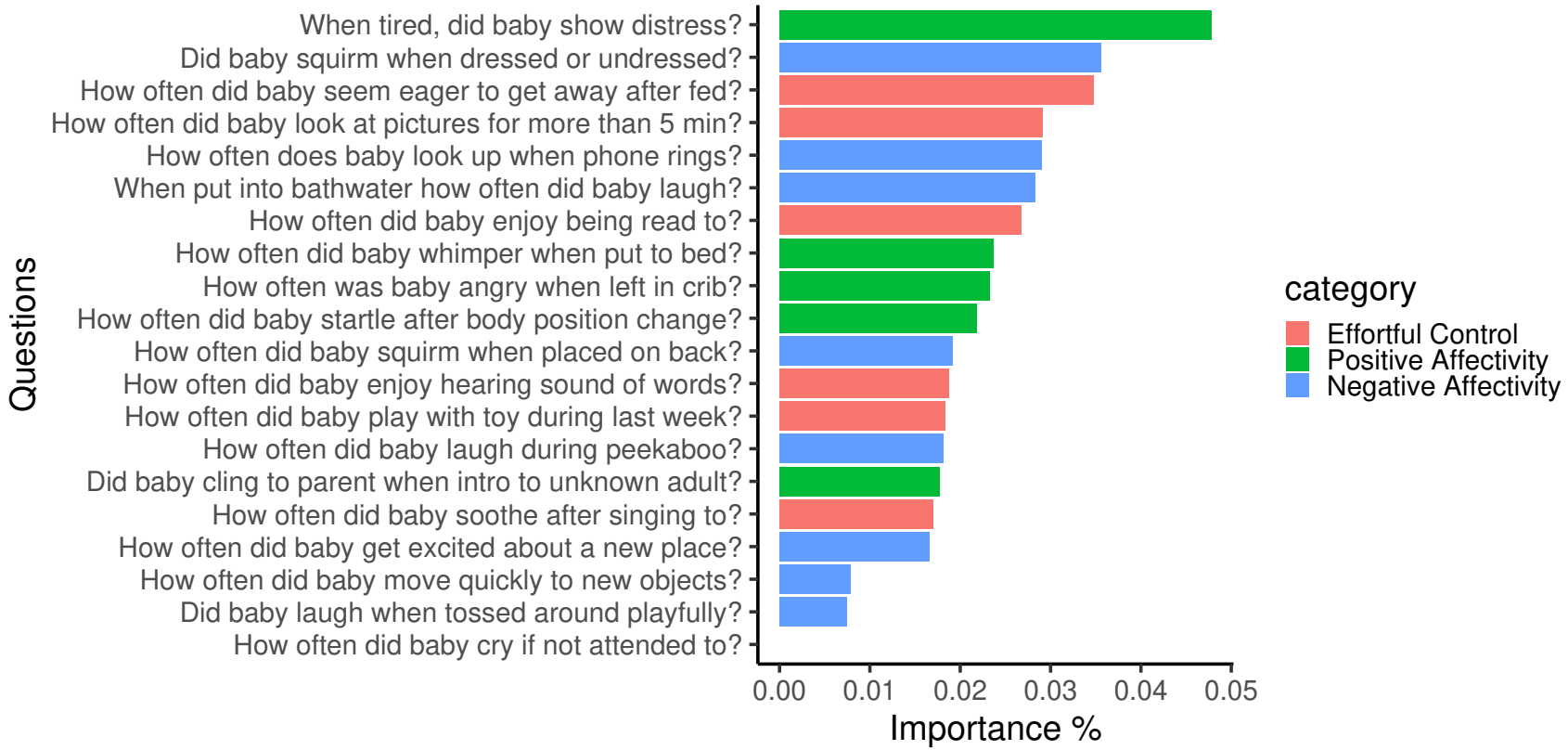

Figure S 12: Feature Importance: Chronological Age Group vs. Pre-Term Group - Itemized Variables

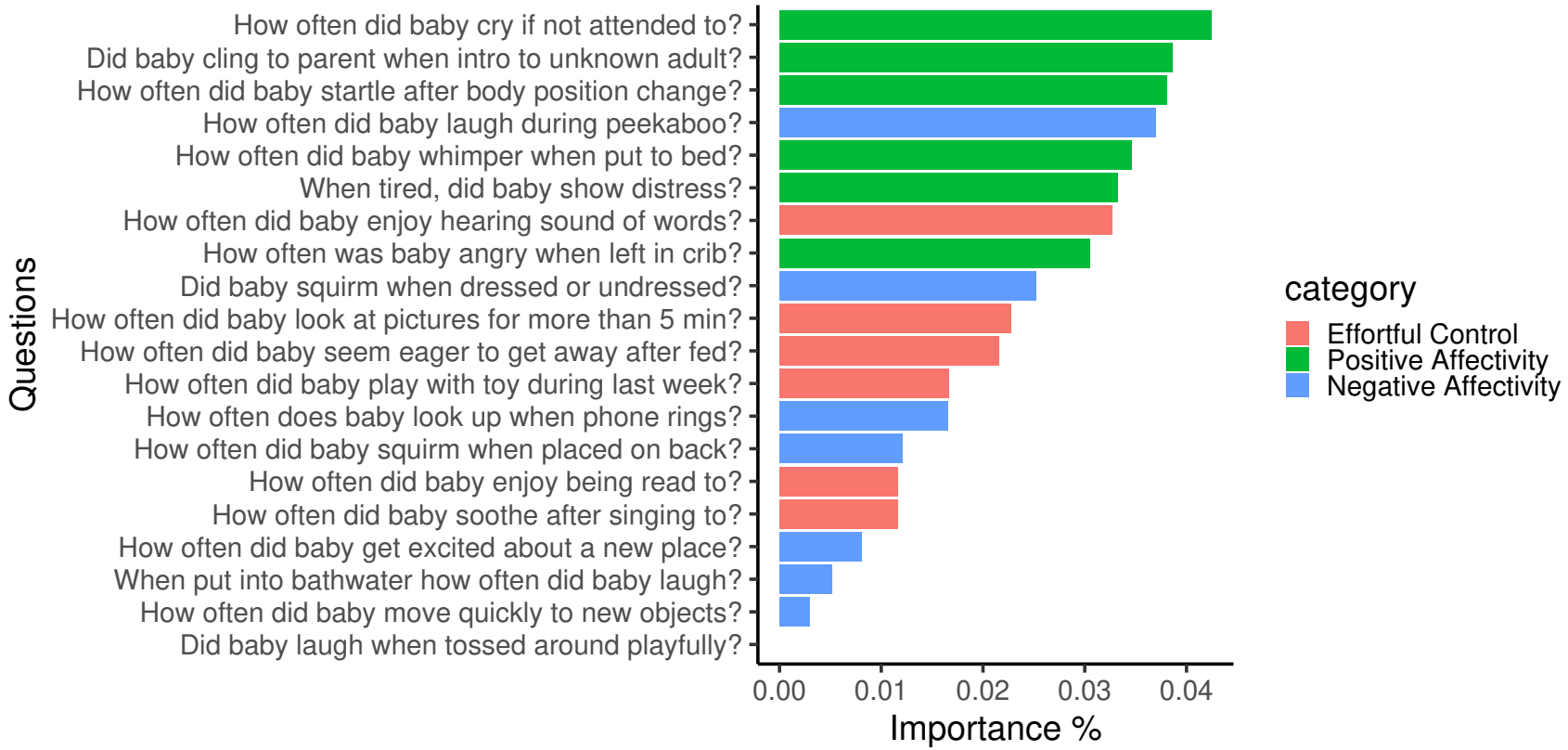

Figure S 13: Feature Importance: Age Adjusted Group vs. Pre-Term Group - Itemized Variables

Table S 5: Model Results: Itemized Variables

models	Chronological VS. Pre-Term: Itemized			Adjusted Age VS. Pre-Term: Itemized		
	accuracy	kappa	AUC	accuracy	kappa	AUC
lda	0.493	-0.014	0.617	0.504	0.009	0.579
glm	0.490	-0.021	0.621	0.524	0.047	0.576
svm	0.493	-0.016	0.550	0.557	0.113	0.618
knn	0.581	0.162	0.603	0.542	0.085	0.565
nb	0.542	0.084	0.576	0.579	0.156	0.578
cart	0.539	0.078	0.542	0.490	-0.020	0.567
c5.0	0.475	-0.051	0.615	0.514	0.029	0.566
bagging	0.517	0.032	0.617	0.532	0.063	0.575
rf	0.500	0.001	0.646	0.574	0.149	0.585
gbm	0.503	0.008	0.600	0.582	0.163	0.623
adabag	0.543	0.084	0.617	0.546	0.093	0.579

Table S 6: Model Results: Factorized Variables

models	Chronological VS. Pre-Term: Factorized			Adjusted Age VS. Pre-Term: Factorized		
	accuracy	kappa	AUC	accuracy	kappa	AUC
lda	0.532	0.064	0.564	0.581	0.162	0.567
glm	0.525	0.050	0.564	0.585	0.169	0.566
svm	0.457	-0.083	0.478	0.519	0.038	0.415
knn	0.458	-0.086	0.467	0.497	-0.004	0.624
nb	0.525	0.050	0.526	0.578	0.156	0.559
cart	0.493	-0.014	0.528	0.504	0.008	0.575
c5.0	0.497	-0.007	0.479	0.514	0.029	0.596
bagging	0.485	-0.029	0.491	0.454	-0.093	0.616
rf	0.447	-0.105	0.495	0.449	-0.102	0.599
gbm	0.489	-0.022	0.517	0.547	0.093	0.584
adabag	0.492	-0.014	0.564	0.568	0.135	0.567

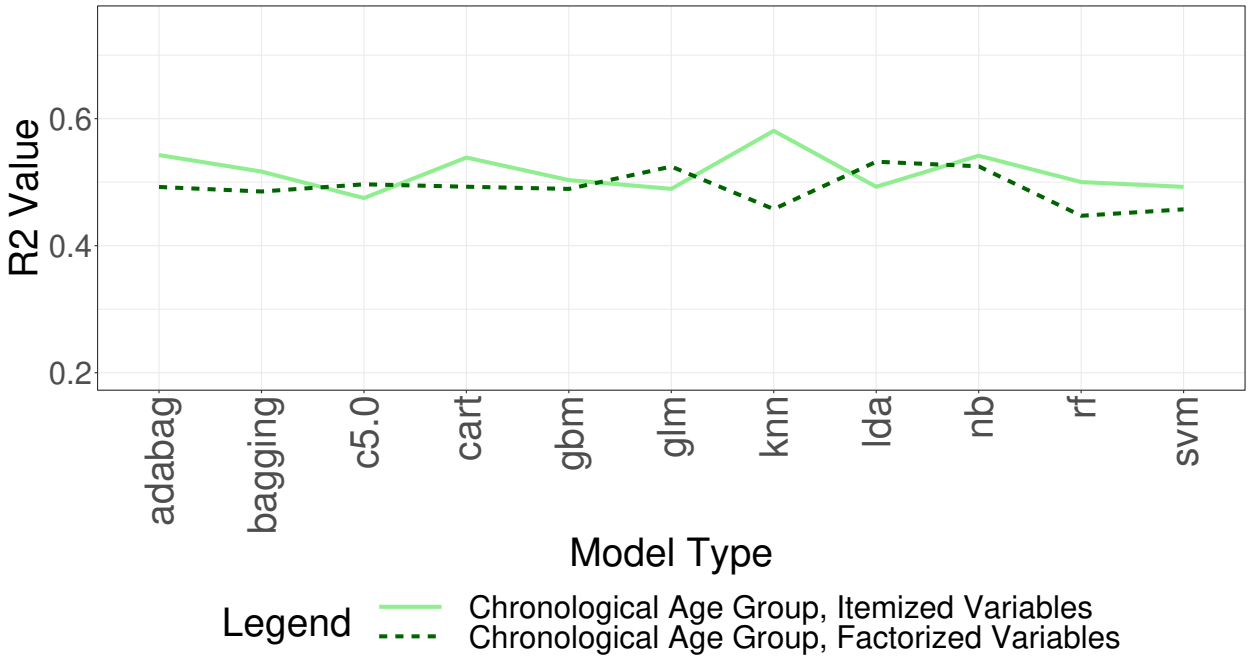

Figure S 14: R2 Comparisons - Chronological Age Group VS Pre-Term Group, Factorized Variables VS. Itemized Variables.

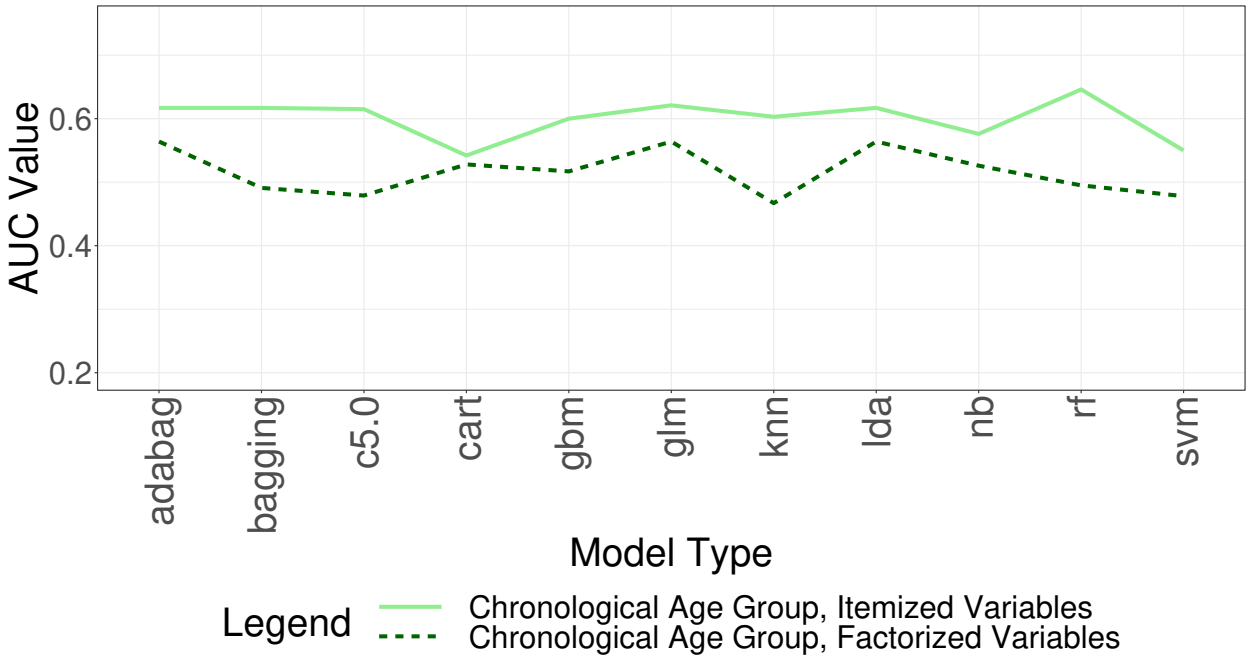

Figure S 15: AUC Comparisons - Chronological Age Group VS Pre-Term Group, Factorized Variables VS. Itemized Variables.

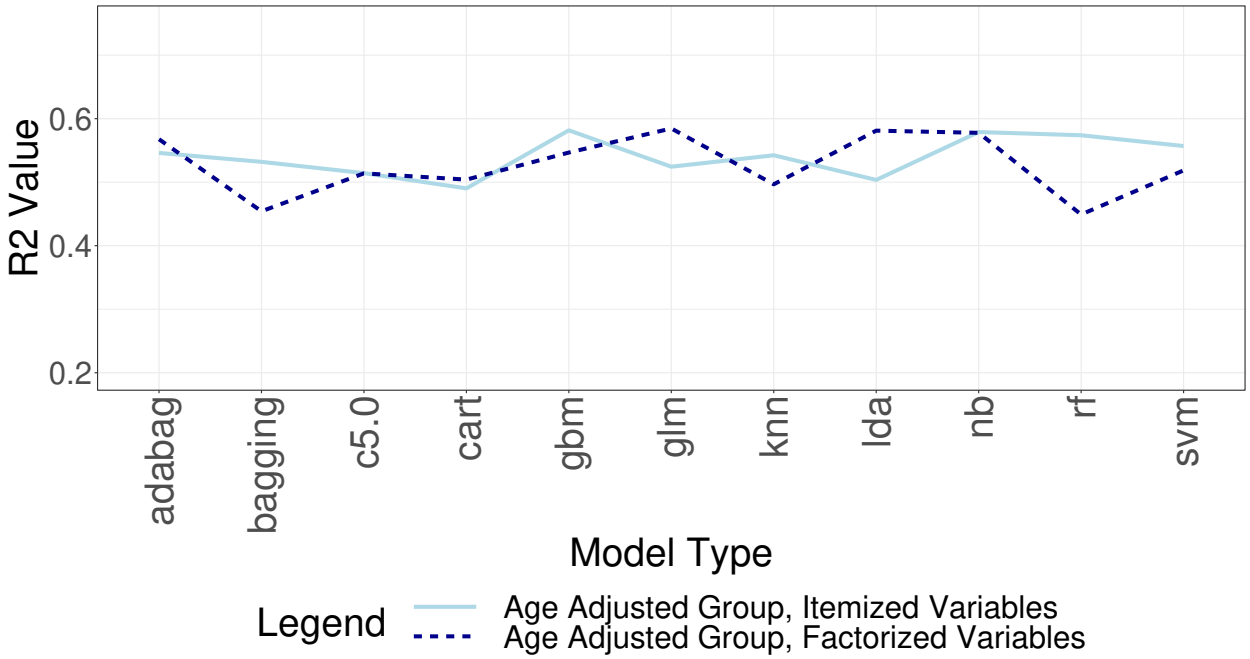

Figure S 16: R2 Comparisons - Age Adjusted Group VS Pre-Term Group, Factorized Variables VS. Itemized Variables.

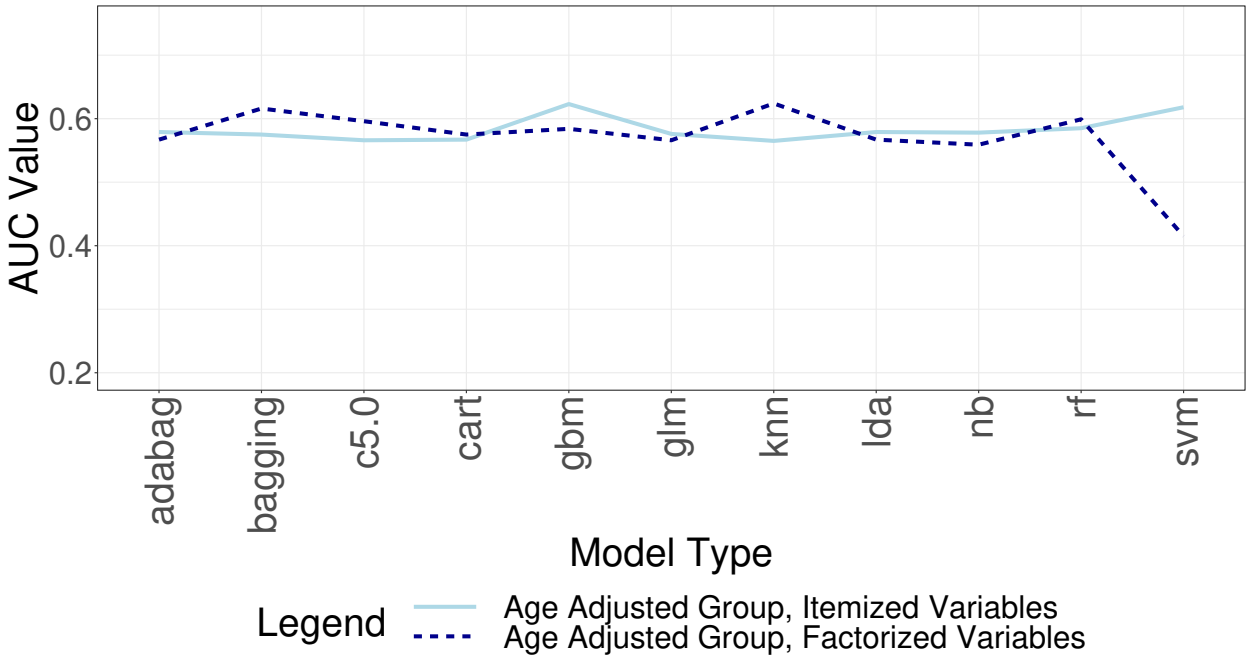

Figure S 17: AUC Comparisons - Age Adjusted Group VS Pre-Term Group, Factorized Variables VS. Itemized Variables.