JHU - Krieger School of Arts & Sciences / Whiting School of Engineering
ASEN.2021.Spring

Course:	EN.601.476.01.SP21: Machine Learning: Data to Models
Instructor:	Rohit Bhattacharya *
Response Rate:	30/31 (96.77 %)

1 - The overall quality of this course is:

Response Option	Weight	Frequency	Percent
Poor	(1)	0	0.00%
Weak	(2)	0	0.00%
Satisfactory	(3)	0	0.00%
Good	(4)	8	26.67%
Excellent	(5)	22	73.33%
N/A	(0)	0	0.00%

Means: Question 4.73, School 4.18, Department 4.17

Response Rate	Mean	STD	Median	School	Mean	STD	Median	Department	Mean	STD	Median
30/31 (96.77%)	4.73	0.45	5.00	10121	4.18	0.94	4.00	1808	4.17	0.94	4.00

2 - The instructor's teaching effectiveness is:

Rohit Bhattacharya

Response Option	Weight	Frequency	Percent
Poor	(1)	0	0.00%
Weak	(2)	0	0.00%
Satisfactory	(3)	0	0.00%
Good	(4)	5	17.24%
Excellent	(5)	24	82.76%
N/A	(0)	0	0.00%

Means: Question 4.83, School 4.25, Department 4.23

Response Rate	Mean	STD	Median	School	Mean	STD	Median	Department	Mean	STD	Median
29/31 (93.55%)	4.83	0.38	5.00	11147	4.25	0.95	5.00	1810	4.23	0.97	5.00

3 - The intellectual challenge of this course is:

Response Option	Weight	Frequency	Percent
Poor	(1)	0	0.00%
Weak	(2)	0	0.00%
Satisfactory	(3)	1	3.33%
Good	(4)	9	30.00%
Excellent	(5)	20	66.67%
N/A	(0)	0	0.00%

Means: Question 4.63, School 4.33, Department 4.31

Response Rate	Mean	STD	Median	School	Mean	STD	Median	Department	Mean	STD	Median
30/31 (96.77%)	4.63	0.56	5.00	10028	4.33	0.80	4.00	1794	4.31	0.85	5.00

4 - The teaching assistant for this course is:

Response Option	Weight	Frequency	Percent
Poor	(1)	0	0.00%
Weak	(2)	0	0.00%
Satisfactory	(3)	0	0.00%
Good	(4)	6	20.00%
Excellent	(5)	21	70.00%
N/A	(0)	3	10.00%

Means: Question 4.78, School 4.34, Department 4.31

Response Rate	Mean	STD	Median	School	Mean	STD	Median	Department	Mean	STD	Median
30/31 (96.77%)	4.78	0.42	5.00	9972	4.34	0.91	5.00	1784	4.31	0.93	5.00

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5 - Please enter the name of the TA you evaluated in question 4:

Response Rate	13/31 (41.94%)

- Jaron Lee
- Jaron
- Jaron
- Baichuan and Jaron
- Jaron Lee
- Jaron and Baichung
- Jaron
- Jaron Lee
- Jaron Lee
- Jaron
- Jaron Lee
- Jared Jia Rong Lee
- Jaron Lee

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6 - Feedback on my work for this course is useful:

Response Option	Weight	Frequency	Percent
Disagree strongly	(1)	0	0.00%
Disagree somewhat	(2)	0	0.00%
Neither agree nor disagree	(3)	2	6.67%
Agree somewhat	(4)	6	20.00%
Agree strongly	(5)	22	73.33%
N/A	(0)	0	0.00%

Means: Question 4.67, School 4.07, Department 3.99

Response Rate	Mean	STD	Median	School	Mean	STD	Median	Department	Mean	STD	Median
30/31 (96.77%)	4.67	0.61	5.00	9966	4.07	1.02	4.00	1784	3.99	1.02	4.00

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7 - Compared to other Hopkins courses at this level, the workload for this course is:

Response Option	Weight	Frequency	Percent
Much lighter	(1)	0	0.00%
Somewhat lighter	(2)	2	6.67%
Typical	(3)	21	70.00%
Somewhat heavier	(4)	7	23.33%
Much heavier	(5)	0	0.00%
N/A	(0)	0	0.00%

Means: Question 3.17, School 3.39, Department 3.60

Response Rate	Mean	STD	Median	School	Mean	STD	Median	Department	Mean	STD	Median
30/31 (96.77%)	3.17	0.53	3.00	9983	3.39	0.92	3.00	1786	3.60	0.95	4.00

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8 - What are the best aspects of this course?

Response Rate	17/31 (54.84%)

• Very practical course for learning how to work with data. Definitely a good course to challenge students to reason about modeling and design choices, and how to come up with assumptions on the data they are working with. Moreover, a good topical course in graphical models and general causal inference. The professor seemed very enthusiastic about sharing the latest and most up-to-date approaches for certain problems and telling us the remaining open problems in the field. The professor was always prepared, and was able to produce very detailed slide deck for the first half of the semester before things picked up in his schedule. Homeworks were well balanced -- there was a mix of theoretical proof-writing, some by-hand applications of graphical algorithms, and coding with real data + analyzing their results. The project is also a great opportunity for improving scientific writing and going through the whole pipeline of modeling design and working with the realities of real data.

• Good lecture. Good assignments/feedback. Good pace for the most part.

• Material, professor

• Teaches many interesting materials that maybe I cannot learn somewhere else

• The professor and TAs are very good at conveying information. The homeworks are interesting and combine theory and coding. The project was an excellent way to use what I had learned.

• Great material that very few classes have made available, and Dr. Bhattacharya was an extremely compassionate instructor. He gave very detailed and individualized feedback. The case studies were outstanding - interesting, practical, really helped me understand course material - a great addition to the course. The final project is a great opportunity for modeling experience, and the peer review idea is a great one.

• The lecturer is excellent!

• The course is structured really well! The professor has done a good job planning out the workload and ensuring it is distributed well throughout the semester. The planning for the material covered is also amazing! Loved the course. The case studies are very relevant to the material unlike some other courses I've taken in the past.

• Getting to learn about PGMs. Rohit was also a great person and instructor.

• The mixture of case studies and lecture material is incredibly useful.

• Rohit really cared about teaching this course and making sure that every student felt welcome and not left behind. I personally had a really difficult semester and was able to work one-on-one with Rohit to make sure that I was learning the material without sacrificing mental health and wellbeing. The topics are a bit abstract at times, but Rohit does a good job balancing theory with real-world examples and especially the days we would do case studies helped to contextualize things we learned in class with the way scientific studies are actually conducted. This class helped introduce me to the workflow of science and research and balanced the perfect "ideal" way to conduct an experiment with the realities that you have to work with.

• Rohit's teaching was amazing, he did a great job making the course engaging with case studies and his lecture thoughts were well organized.

• Dr. Bhattacharya is an amazing professor. His slides and lectures were fantastic. He was a really good explainer of ideas. I really enjoyed his approach to breakout rooms with the Jamboard. He really added his own personal flare to the course and was very passionate about the material. I'm a graduating senior and this was definitely the best course I've taken at Hopkins. Thank you for an amazing semester :)

• Provide practical knowledge and the material covered in very contemporary and relevant. furthermore, the teacher provide case studies every once-in-a-while to synthesize the material, which is very helpful

• Useful practical causal tools introduced and walked-through by Professor, Excellent feedback on project (at all stages) and the HW assignments

• Awesome professor, well structured lectures, real-world examples

• The instructor was by far the best aspect of the course. He was extremely knowledgable and truly cared about our learning and our general well being as students. This has been one of the few classes were I thought the professor really cared about how much we learned instead of preparing us for tests/assignments.

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9 - What are the worst aspects of this course?

Response Rate	14/31 (45.16%)

• Pacing: Back half of the course seemed a bit sparse -- the project timeline seemed a bit stretched out. I think the first part of the course which was more traditional with homeworks that supplemented the lectures should be extended.

• Pace around between HW3/4 was a bit too fast/technical.

• Sometimes I cannot follow instructor's teaching flow. I feel it is fast.

• Some of the homeworks had typos and had to be updated.

• I did not quite think that the homework assignments helped me to reach the learning objectives for this course. I think I would have benefitted from more practical and challenging homework assignments, including areas in which I had to go through problem formulation - this part of the modeling task was generally left out of homeworks I'd say, and I found myself a bit overwhelmed by the final project when I was responsible for this part. There were some other aspects of the modeling pipeline, like choosing distributions to describe relationships, that I didn't gain as much experience as I'd want to, as these decisions were often made for us in homeworks/ case studies, and the final project is largely self-motivated.

• n/a

• N/A

• The programming components of the course are almost too straightforward and don't contribute to solidifying an understanding of the theoretical material.

• I guess the *worst* thing about this course is that it was pretty separate from anything else I've taken, so it's maybe not going to be useful for me down the road, but it was still fun to learn about.

• I wish the course offered more examples of causal DAGs used outside of answering scientific questions.

• none

• the little lack of mathematical rigor

• Almost all explanations and examples were given in biomedical / psychology domain, which is reasonable given that this is where causal tools are probably most useful, but it would help to give examples outside this domain for those doing their final projects in different domains

• I think the course was a little repetitive at times since sections just felt like a slight variation of an previous model.

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10 - What would most improve this class?

Response Rate	15/31 (48.39%)

• More balanced project timeline -- e.g. dedicate the last 5 weeks of the course to project rather than the last 7-8 weeks (roughly the time period between proposal deadline to final project deadline). Leaving some time for more core lecture content would be great to expand our knowledge base on methodology.

• Maybe slightly slower pace.

• More real life examples that use theoretical formulas

• This is a great class!

• More challenging and practically oriented homework, to address the point above. Perhaps multiple projects, or at least more significant coding portions which involve more model decision-making. Also, Dr. Bhattacharya made an excellent effort to alternate between big picture overview and low-level details, but sometimes these efforts weren't effective (at least from my perspective). I think the course may have benefitted by focusing more on big picture, 'connective' ideas in class, and leaving some of the more detailed derivations outside of class time or as prep for case studies, as I was unable to follow these in real time and it can be difficult to recover focus when it's lost. I think there were a few times when these kinds of derivations were bumped to the homework, and that was helpful. I also would've appreciated more emphasis on EM, variational inference, and some other more advanced topics, but don't have any proposed topics to drop to make room for them, so I understand this isn't too useful.

• Giving more feedback on the homwork! Maybe hosting some homework sessions.

• n/a

• After 2/3 through the semester the course seemed to take a different format / style. The first half was really organized with good slides and lectures. Whiteboard work and causal discovery could also benefit from slides / visuals.

• More emphasis on programming. More emphasis on optimization / learning of PGMs.

• Honestly this was maybe the best-run class I've taken at Hopkins, I don't have a lot of feedback here.

• none

• would benefit from increased mathematical rigors, provide proofs and deeper probabilistic and algorithmic theoretical reasoning to deepen our understanding

• The course is great as it is, but adding more examples outside biomedical domain and discussing practical challenges on non-tabular / missing data could make the course even better

• More case-studies!

• I think more of the assignments could have more technically or real world coding examples. I think too many of the coding was too structured and didn't really give us a chance to fully explore the tools.

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11 - What should prospective students know about this course before enrolling? (You may comment on any aspect of this course such as assumed background, readings, grading systems, and so on.)
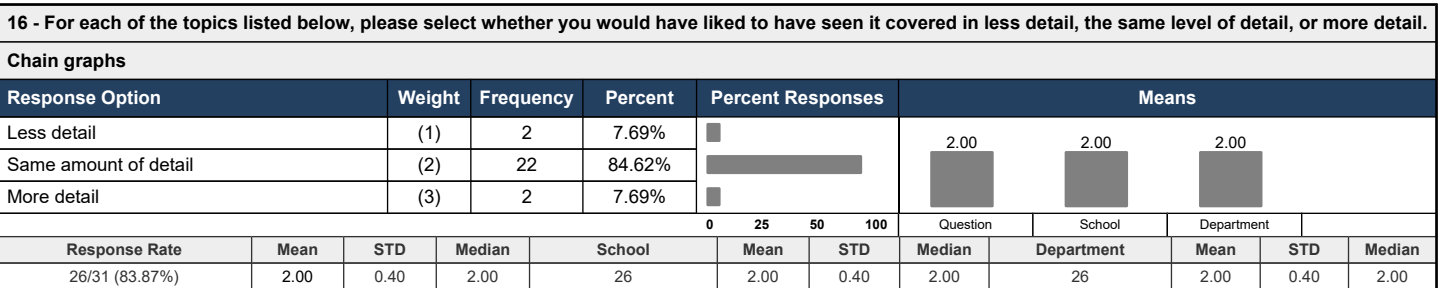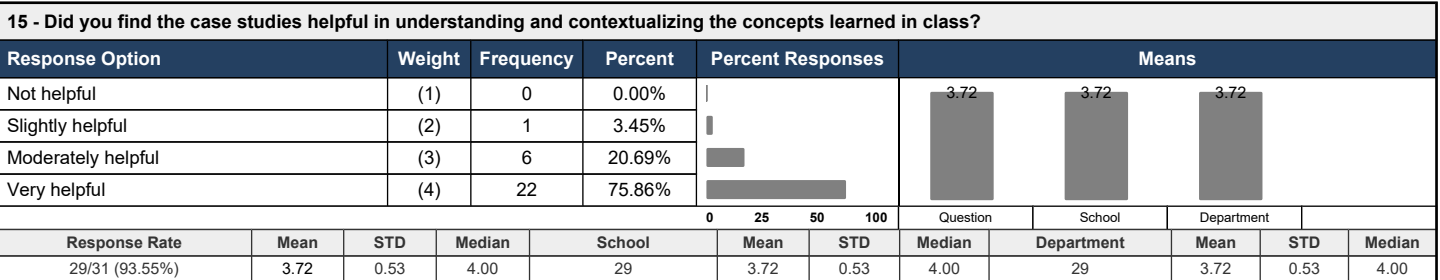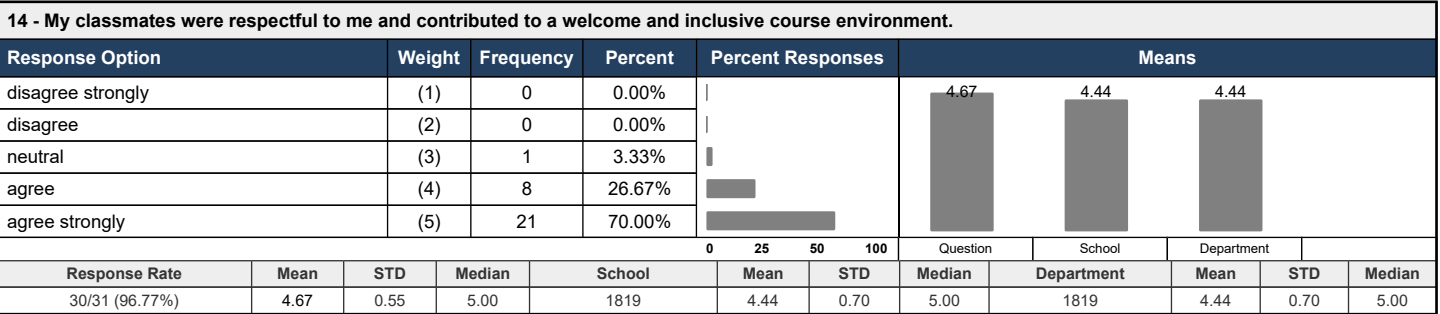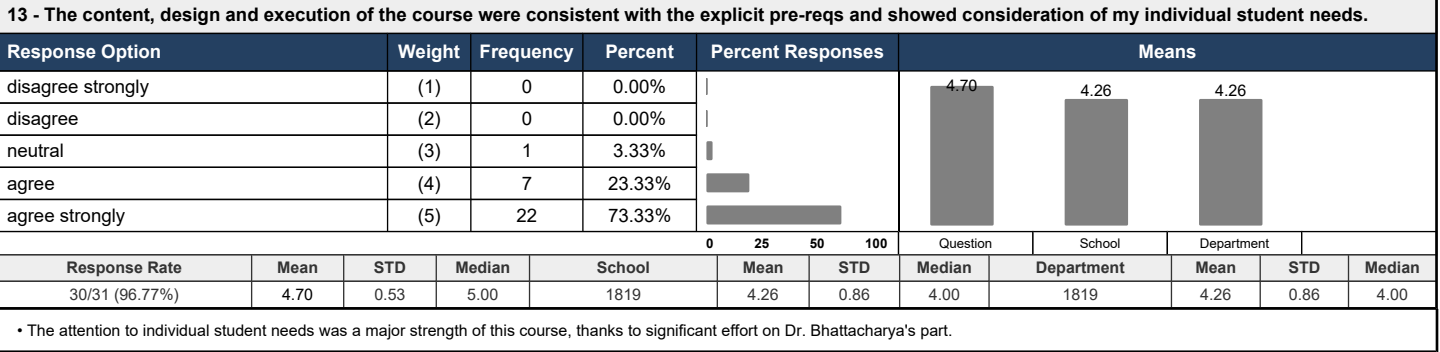
Response Rate	13/31 (41.94%)

• Highly recommend a good foundation in machine learning and statistics. Some previous exposure to causal reasoning is helpful, though not needed. Some previous exposure to graphical models can help, though not needed. Being comfortable with technical writing and the general academic research workflow can help.

• Good class.

• Work hard

• This class is not as soul crushing as 475.

• Great class, I'd highly recommend taking it! Assumed background is familiarity with probability/statistics, grading is very fair, and while there are not many assigned readings I'd highly recommend Daphne Koller's Probabilistic Graphical Models textbook, which really helped me understand the course material in more depth, especially when working on the final project.

• The professor makes sure that it's very difficult to lag behind in this course, as he repeats and reiterates important information at every lecture so make sure you attend all of them!

• N/A

• The course material is heavily dependent on the instructor. The focus of the course this semester leaned more toward causal inference as opposed to PGMs more generally.

• Definitely ask questions and engage with the instructors and materials. It is absolutely a no-judgment zone and they are more than happy to work with you to make sure you're not struggling.

• This is a great course. You must be comfortable with a little mathematical rigor, but you'll be alright.

• need to know probability and a bit of python

• This is primarily a class on graphical models, not so much on machine learning

• While the lecture slides and course material is excellent, please attend the lectures since being there is the most rewarding part of learning experience. I believe this class will be taught by a different instructor in the future so be warned that it could be a very different experience

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12 - The course staff (instructor, TA, CAs) provided a welcome and inclusive learning environment for all students. (Detailed feedback could be provided here.)

Response Option	Weight	Frequency	Percent	Percent Responses	Means		
disagree strongly	(1)	0	0.00%		4.73	4.37	4.37
disagree	(2)	0	0.00%				
neutral	(3)	1	3.33%				
agree	(4)	6	20.00%				
agree strongly	(5)	23	76.67%		Question	School	Department

Response Rate	Mean	STD	Median	School	Mean	STD	Median	Department	Mean	STD	Median
30/31 (96.77%)	4.73	0.52	5.00	1819	4.37	0.80	5.00	1819	4.37	0.80	5.00

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13 - The content, design and execution of the course were consistent with the explicit pre-reqs and showed consideration of my individual student needs.

Response Option	Weight	Frequency	Percent
disagree strongly	(1)	0	0.00%
disagree	(2)	0	0.00%
neutral	(3)	1	3.33%
agree	(4)	7	23.33%
agree strongly	(5)	22	73.33%

Means: Question 4.70, School 4.26, Department 4.26

Response Rate	Mean	STD	Median	School	Mean	STD	Median	Department	Mean	STD	Median
30/31 (96.77%)	4.70	0.53	5.00	1819	4.26	0.86	4.00	1819	4.26	0.86	4.00

• The attention to individual student needs was a major strength of this course, thanks to significant effort on Dr. Bhattacharya's part.

14 - My classmates were respectful to me and contributed to a welcome and inclusive course environment.

Response Option	Weight	Frequency	Percent
disagree strongly	(1)	0	0.00%
disagree	(2)	0	0.00%
neutral	(3)	1	3.33%
agree	(4)	8	26.67%
agree strongly	(5)	21	70.00%

Means: Question 4.67, School 4.44, Department 4.44

Response Rate	Mean	STD	Median	School	Mean	STD	Median	Department	Mean	STD	Median
30/31 (96.77%)	4.67	0.55	5.00	1819	4.44	0.70	5.00	1819	4.44	0.70	5.00

15 - Did you find the case studies helpful in understanding and contextualizing the concepts learned in class?

Response Option	Weight	Frequency	Percent
Not helpful	(1)	0	0.00%
Slightly helpful	(2)	1	3.45%
Moderately helpful	(3)	6	20.69%
Very helpful	(4)	22	75.86%

Means: Question 3.72, School 3.72, Department 3.72

Response Rate	Mean	STD	Median	School	Mean	STD	Median	Department	Mean	STD	Median
29/31 (93.55%)	3.72	0.53	4.00	29	3.72	0.53	4.00	29	3.72	0.53	4.00

16 - For each of the topics listed below, please select whether you would have liked to have seen it covered in less detail, the same level of detail, or more detail.

Chain graphs

Response Option	Weight	Frequency	Percent
Less detail	(1)	2	7.69%
Same amount of detail	(2)	22	84.62%
More detail	(3)	2	7.69%

Means: Question 2.00, School 2.00, Department 2.00

Response Rate	Mean	STD	Median	School	Mean	STD	Median	Department	Mean	STD	Median
26/31 (83.87%)	2.00	0.40	2.00	26	2.00	0.40	2.00	26	2.00	0.40	2.00

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Response Rate: 30/31 (96.77 %)

16 - For each of the topics listed below, please select whether you would have liked to have seen it covered in less detail, the same level of detail, or more detail.

Acyclic directed mixed graphs

Response Option	Weight	Frequency	Percent	Percent Responses	Means		
Less detail	(1)	2	7.69%		2.04	2.04	2.04
Same amount of detail	(2)	21	80.77%				
More detail	(3)	3	11.54%				
				0 25 50 100	Question	School	Department

Response Rate	Mean	STD	Median	School	Mean	STD	Median	Department	Mean	STD	Median
26/31 (83.87%)	2.04	0.45	2.00	26	2.04	0.45	2.00	26	2.04	0.45	2.00

16 - For each of the topics listed below, please select whether you would have liked to have seen it covered in less detail, the same level of detail, or more detail.

Estimation of causal effects

Response Option	Weight	Frequency	Percent	Percent Responses	Means		
Less detail	(1)	0	0.00%		2.68	2.68	2.68
Same amount of detail	(2)	9	32.14%				
More detail	(3)	19	67.86%				
				0 25 50 100	Question	School	Department

Response Rate	Mean	STD	Median	School	Mean	STD	Median	Department	Mean	STD	Median
28/31 (90.32%)	2.68	0.48	3.00	28	2.68	0.48	3.00	28	2.68	0.48	3.00

16 - For each of the topics listed below, please select whether you would have liked to have seen it covered in less detail, the same level of detail, or more detail.

Missing data/selection bias

Response Option	Weight	Frequency	Percent	Percent Responses	Means		
Less detail	(1)	1	3.85%		2.35	2.35	2.35
Same amount of detail	(2)	15	57.69%				
More detail	(3)	10	38.46%				
				0 25 50 100	Question	School	Department

Response Rate	Mean	STD	Median	School	Mean	STD	Median	Department	Mean	STD	Median
26/31 (83.87%)	2.35	0.56	2.00	26	2.35	0.56	2.00	26	2.35	0.56	2.00

16 - For each of the topics listed below, please select whether you would have liked to have seen it covered in less detail, the same level of detail, or more detail.

Structure learning

Response Option	Weight	Frequency	Percent	Percent Responses	Means		
Less detail	(1)	1	3.70%		2.44	2.44	2.44
Same amount of detail	(2)	13	48.15%				
More detail	(3)	13	48.15%				
				0 25 50 100	Question	School	Department

Response Rate	Mean	STD	Median	School	Mean	STD	Median	Department	Mean	STD	Median
27/31 (87.10%)	2.44	0.58	2.00	27	2.44	0.58	2.00	27	2.44	0.58	2.00