

From Structure to Fish to Blobs: an AE 8002 Seminar Comparative Analysis

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Comparing Lectures by:

Dr. Tyler Tallman (Purdue): The Self-Sensing Inverse Problem: Deducing Quantitative Full Field Mechanics from Limited Electrical Data

Dr. Rajat Mittal (Johns Hopkins University): Dissecting the Causality of Pressure Forces in Vortex Dominated Flows - From Fish Schools to Noisy Drones

Dr. Bahador Bahmani: Interpretable Data-Driven Modeling in Solid Mechanics with Limited Data

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Other Seminars Attended

Dr. Pakpong Chirarattananon (City University of Hong Kong): Miniature Aerial Robotics: Achieving Versatility, Efficiency, and Autonomy for Real-World Impact

Dr. Paul Papas (RTX Technology Resource Center): Challenges for Sustainable Aviation

Dr. Karin Lehnigk (Georgia Tech): Insights from Outburst Flood-Eroded Planetary Landscapes

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AE 8002 Classes attended

(all except for the lectures on 4/2/2024 and 4/9/2024)

Going to a top-tier research university affords me the unique privilege of being able to attend lectures from visiting and invited experts who are presenting their cutting-edge research. However, despite the high quality of research being conducted, the way in which this research is being presented may serve to detract from the subject-matter. As a first-year master's student in Aerospace, I have a limited grasp on the cutting-edge research, and yet enough background to determine whether a subject matter has been effectively represented or transmitted, and may even be understood by someone without an Aerospace or Mechanical Engineering background. In fact, the effectivity of a lecture is determined by a few factors that are separate entirely from the quality of research: the comfort level of the speaker, the flexibility of metaphor or imagery implemented by the presentation, and the overall circumstances of the presentation. I will elucidate on this based off of my observation of three specific lectures: a lecture given by Dr. Tallman about the self-sensing inverse problem, a lecture given by Dr. Mittal about pressure forces in vortex-dominated flows, and a lecture given by Dr. Bahmani about data-driven modeling.

I'll begin by analyzing the content of the lectures as transmitted through the visuals. This factor contributed only slightly to the general effectivity of the lectures. Certainly, some subjects lend themselves to better graphics than others: Dr. Mittal's lecture blew the others out of the water by having beautiful CFD animations of swimming fish. And even though the math cluttered the screen a little, since understanding the research conclusions did not hinge upon understanding the math derivations, it was okay that the focus was on the CFD portrayals and animations. Dr. Tallman's slides represented strain in structures, something that lends itself very well to graphical representation. Since Dr. Tallman's research was also heavily involved in math, it was important that he represent the math graphically well in his presentation, which he managed to pull off: the slides he presented were uncluttered and visually balanced, so as to allow the audience to focus in on the equations and derivations. On the other hand, Dr. Bahmani was talking about pure data, with little to no application – the slides contained blobs to be differentiated over, depictions of neural nets, and some graphs. Out of all three lectures, I was the least familiar with his subject matter, though, so perhaps the relative effectivity of the graphics or visualizations were not a factor in my understanding. But I found that the graphics did not help a lay person like me understand what application there was, if any, for that research. I could also not come away from that presentation with an understanding of the "takeaway." Something in the presentation could have at least led me to a bottom line.

I'll continue my analysis by comparing the overall comfort level of the three gentlemen, as evidenced by their demeanor, speaking style, and general ease of transmission of material in terms of jargon vs. explanation. It goes without saying that Dr. Mittal, the oldest and most experienced of the gentlemen, was the most comfortable giving his presentation. He spent all his time on one side of the room looking at either the audience or his presentation itself. His body language was relaxed, and he made eye contact with several folks who asked him questions. His ease of explaining the subject matter was clear in the way that he was able to readily answer clarifying questions from audience members who were not in his field (there was a biologist in the audience). Dr. Mittal did not need to insert jokes in order to captivate the audience, but the way that he talked about the subject matter (by breaking down the topic into bite-sized

proportions) was enough to keep folks engaged. The worst speaker of the three was Dr. Bahmani. Though he was professional, and made the occasional understandable referential joke, it was not enough to keep the audience engaged. The information was dryly and obtusely presented, and there was nothing to indicate that the speaker himself understood where the knowledge gap between him and his audience laid. Dr. Tallman gave an excellent presentation – clear, direct, and with good knowledge of his audience (grad students in Civil Engineering). Though the math concepts went a little beyond me, he held my interest by consistently bringing the lecture back to the main point, the big idea. Even though he was not as seasoned at lecturing as Dr. Mittal, I have no doubt he'll grow to be as excellent and relaxed a speaker.

The comfort level was the most important for my first impression and gave an indicator of quality, but the absolute most important thing is what I will talk about last: the effect of the type of lecture hall on each presentation. Dr. Tallman and Dr. Mittal both gave their lectures in smaller classrooms. Dr. Tallman had an attendance of about 6 people, and coffee and donuts were provided. Dr. Mittal's attendance was about 40 people. Dr. Bahmani had an attendance of around 35 people and was in a large lecture hall meant for over 100 people. (These attendance numbers are estimated from memory.) Dr. Mittal's room was veritably packed with both students and professors. It was standing room only. Naturally, the atmosphere was exciting. Professors interrupted with quick-fire questions, quips, and even jokes. There was an energized feeling. Another thing was that there were no desks, only chairs. Students did not automatically take out their laptops to have a distraction, adding to the feeling of engagement. Dr. Tallman's lecture, though poorly attended, felt like it was warm and casual due to the smaller classroom venue and the offering of coffee and donuts. Also, two to three professors in attendance smiled at those who entered, and there was a welcoming feeling. I also feel that I should point out that the lights were all the way on, and so the focus was much more on the speaker rather than the slides themselves. In Dr. Bahmani's case, the deck was stacked against him in terms of atmosphere: though there were many in attendance, the room felt cavernous. Weber also has tiered seating and a stage for the speaker, so Dr. Bahmani felt even more disconnected from the listeners. Students were drawn toward the back of the room, distracted, disengaged, typing loudly. The sound from Dr. Bahmani's voice echoed pitifully as one-by-one, students who had come to attend on assignment checked out and thought about something else.

I have learned a few powerful lessons from this experience: graphics are a key component of any good presentation, and graphics should be used in order to make clear what the big takeaway of a presentation is supposed to be, no matter what the subject is. Next, the more relaxed I feel towards my audience, the better my presentation will be. Finally, as a presenter, I should be aware of the effect my audience size and the room size have on the effectiveness of my presentation.