**Understanding and designing glasses via machine learning**

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Glasses are non-crystalline, non-equilibrium substances that spontaneously relax to the supercooled liquid state and (under adequate conditions) crystallize. Since the XVII century, they have been called the "eyes of science" (telescopes and microscopes) and have since found numerous other conventional and high-tech applications in medicine, odontology, optics, electronics, telecommunications, construction, and architecture.

              Advances in the computational modeling of the relationships between the chemical composition and properties of glasses are already helping researchers understand and develop new formulations, with substantial savings in time and resources compared to the traditional "cook and check" or "try-and-get lucky" approaches.

              This seminar will show how machine learning algorithms can guide us in navigating the multidimensional space of the infinite possibilities of glass compositions in multi-property optimization problems. We will present some successful examples of the artificial intelligence-guided design of special optical glass and a "crystal" glass with predetermined combinations of refractive index, Abbe number, and glass transition temperature. This category of simulations can also help us decode the glass "genome" to understand the complex relationships between glasses' chemical composition, structure, and innumerable properties. The future of these techniques in developing novel vitreous materials is indeed bright. For all the wonderful uses that make our lives much more comfortable, 2020 was chosen by the UN as the International Year of Glass!

Refs.

[The glassy state of matter: Its definition and ultimate fate](https://scholar.google.com.br/citations?view_op=view_citation&hl=pt-BR&user=IEHmx54AAAAJ&citation_for_view=IEHmx54AAAAJ:LGlY6t8CeOMC)

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[Explainable machine learning algorithms for predicting glass transition temperatures](https://scholar.google.com.br/citations?view_op=view_citation&hl=pt-BR&user=IEHmx54AAAAJ&cstart=20&pagesize=80&sortby=pubdate&citation_for_view=IEHmx54AAAAJ:ybfzIt2tCtgC)

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[Designing optical glasses by machine learning coupled with a genetic algorithm](https://scholar.google.com.br/citations?view_op=view_citation&hl=pt-BR&user=IEHmx54AAAAJ&cstart=20&pagesize=80&sortby=pubdate&citation_for_view=IEHmx54AAAAJ:vjZqxyZ7hS4C)

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