

iGEM team helps prevent rogue use of synthetic biology

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A team of students from ENSIMAG, an engineering school in Grenoble, France, and Virginia Tech is using bioinformatics to implement federal guidance on synthetic genomics. The students' work will help gene synthesis companies and their customers better detect the possible use of manufactured DNA as harmful agents for bioterrorism.

Synthetic biology offers huge potential for practical applications in medicine, energy production, agriculture, and other areas. For a few thousand dollars, it is now possible to design custom [DNA sequences](#) the size of a viral genome, order these sequences from a DNA manufacturer, and receive the DNA in the mail within a few weeks. Experts are concerned, however, about the potential misuse of these emerging technologies and that is where the student's project could play a key role in preventing synthetic biology malpractice.

Jean Peccoud, associate professor at the Virginia Bioinformatics Institute (VBI) at Virginia Tech and leader of Virginia Tech's iGEM initiatives, said, "The students have taken great strides in implementing different possible interpretations of the federal recommendations. Their work characterizes the relationship between the computational cost of the screen and its sensitivity. This independent scientific analysis will identify practical solutions compatible with the operational constraints of commercial operators and refine policies aimed at protecting the nation without undermining its competitiveness."

Algorithms under development assess how similar a specific DNA

sequence is to entries in the Centers for Disease Control and Prevention's Select Agent and Toxin List. Keyword lists help to track down matches and allow for continual fine-tuning of the effectiveness of each search. The students are compiling a database of test cases that allows them to estimate the performance of different screening strategies.

Edward You, supervisory special agent in the Federal Bureau of Investigation's (FBI) Weapons of Mass Destruction Directorate, had the opportunity to visit VBI on June 4 and gave a seminar entitled "Biosecurity: The roles and responsibilities of academia and law enforcement". During his visit, he met with some of the students working on the iGEM project. "The students should be commended for tackling a real-life problem directly related to national security needs," said Agent You. By working on this significant project, they are actively participating in the development of responsible practice for this transformative science, which is exactly what the government of this country wants to encourage." He added: "It is very promising to see undergraduate students at iGEM engage their peers in thinking about biosecurity. The groundbreaking work of this international team impacts the safety of people around the globe."

Skip Garner, executive director of VBI, commented: "This project would not have been possible without the support of the MITRE Corporation and Science Applications International Corporation. The sponsorship of these two industrial organizations, widely recognized for their expertise in defense and security, will certainly help transform these scientific results into meaningful outcomes for society."

The final results of the Virginia Tech-ENSIMAG biosecurity team's analyses will be presented in November at the International Genetically Engineered Machines (iGEM) [synthetic biology](#) competition organized by the Massachusetts Institute of Technology.

More information:

US Department of Health and Human Services voluntary guidelines "Screening Framework Guidance for Synthetic Double-Stranded DNA Providers" November 2009. See bit.ly/cwkcph

Minimizing the Risks of Synthetic DNA: Scientists' Views on the US Governments Guidance on Synthetic Genomics. American Association for the Advancement of Science workshop. See bit.ly/98o0kO

The Presidential Commission for the Study of Bioethical Issues
bit.ly/dys4rs

For a taste of the iGEM competition, please consult the following video:
bit.ly/9mqOIG

Provided by Virginia Tech

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