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## **An artificial pancreas for people with type 1 diabetes based on nonlinear model predictive control**

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Type 1 diabetes (T1D) is a chronic disease caused by autoimmune destruction of the pancreatic insulin-producing cells. People with T1D spend significant amounts of time on self-treatment with insulin infusion or injections. However, this task is non-trivial, and administering too much insulin can be dangerous. Conversely, administering too little insulin for longer periods of time can lead to long-term complications. We present an artificial pancreas (AP) for controlling the blood glucose concentration in people with T1D. The AP consists of 1) a sensor (a continuous glucose monitor), 2) actuators (e.g., an insulin pump), and 3) a nonlinear model predictive control algorithm implemented on a smartphone. We discuss the computational aspects of the algorithm (optimal control, state estimation, and maximum likelihood parameter estimation) as well as the clinical trial in which it is currently being tested. Finally, we present numerical results for 50 virtual people with T1D.

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