

Dilute Magnetic Semiconductors for Spintronics: Mn:GaN

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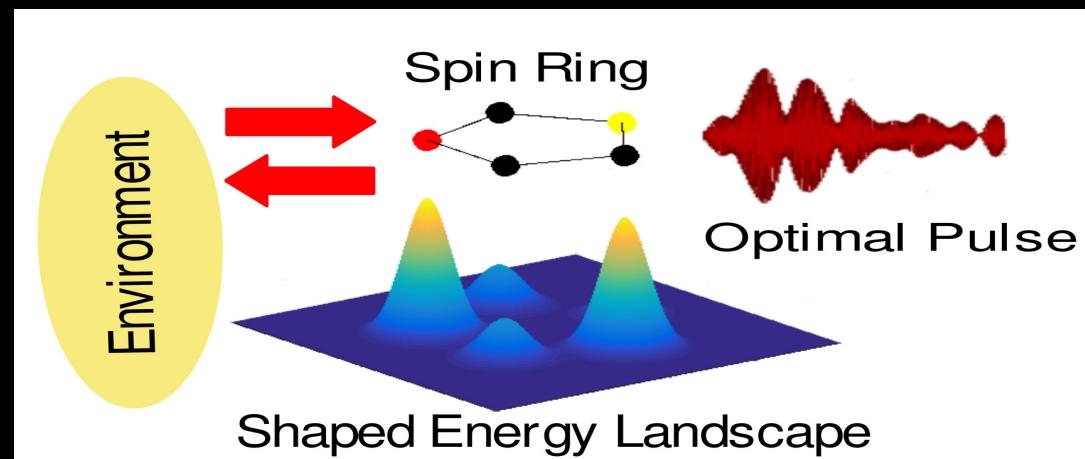
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Quantum Control

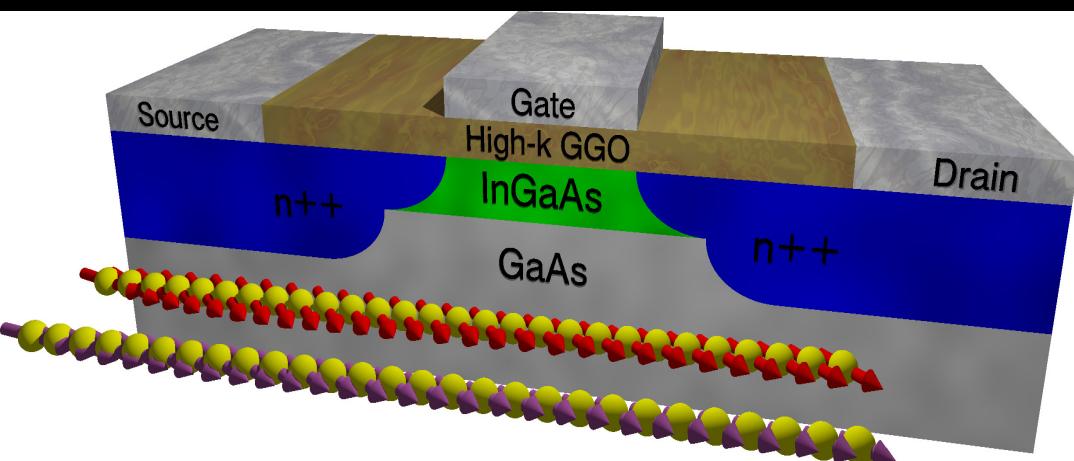
- Find optimal fields u_k to *steer the dynamics* of a quantum system

$$i\hbar \frac{\partial |\Psi\rangle}{\partial t} = \left(H_0 + \sum_k u_k(t) H_k \right) |\Psi\rangle$$

Hamiltonian H_u



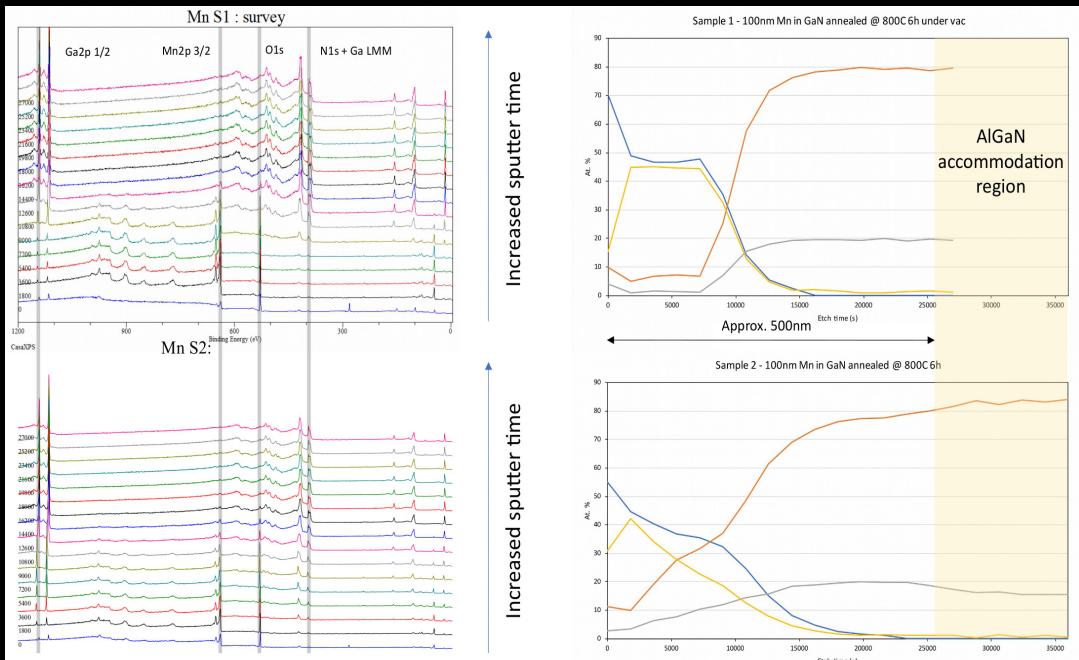
- Using optimisation, simulation, Bayesian parameter estimation, empirical models, reinforcement learning
- E.g. controlling spin polarisation in an *InGaAs MOSFET* at room temperature with a Monte Carlo simulator



- Magnetisation refocusing
- Electrical coherent control
- Strain dependence of magnetisation

Dilute Magnetic Semiconductors Mn:GaN

- *Spin injection*: spintronics requires spin-polarised carriers
- Compound semiconductors doped with Ni, Co, Mn, Cr become magnetic
 - Should maintain spin polarisation for injection
 - Literature suggests high Curie temperature and doping possible via thermal annealing



- Initial *characterisation results* of annealed samples
 - MnO layer, negligible diffusion at lower temp.
 - Mn diffusion at higher temp., but damage to (Al)GaN layer

► Next: ion beam implantation or growth?