Advanced Modeling for Optimized and Autonomous Manufacturing

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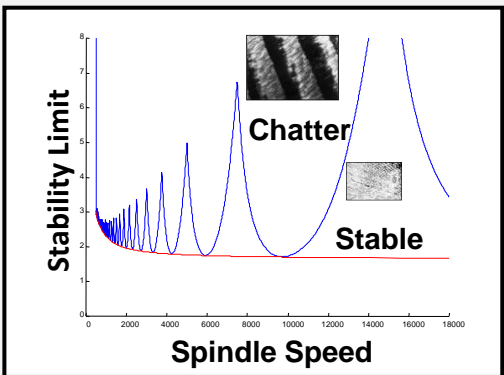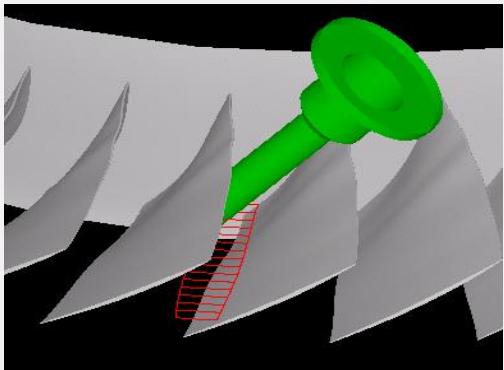http://people.sabanciuniv.edu/~ebudak/

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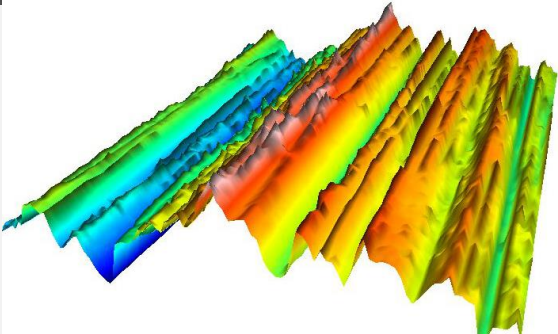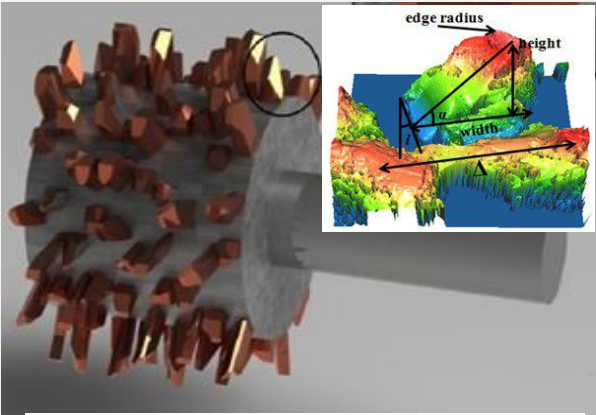## Machining Process Modeling

- Process digital twin
- Cutting force modeling
- Thermomechanical model
- Dynamics and chatter stability
- Monitoring and modeling of tool wear
- Process simulation and optimization
- Cutting tool design for increased productivity

Machine Tool Design and Optimization

- Modeling and optimization of machine tool structures
- Simulation of static, dynamic and thermal behavior of machine tools
- High-speed spindle design
- Machine learning for spindle and structural identification
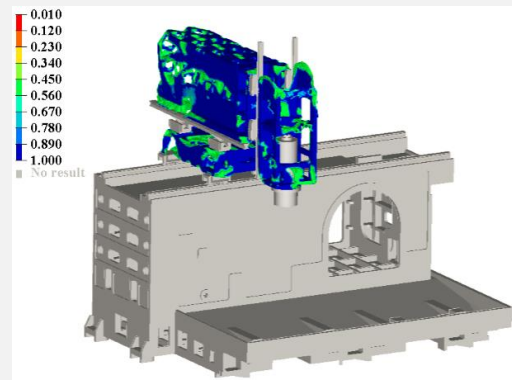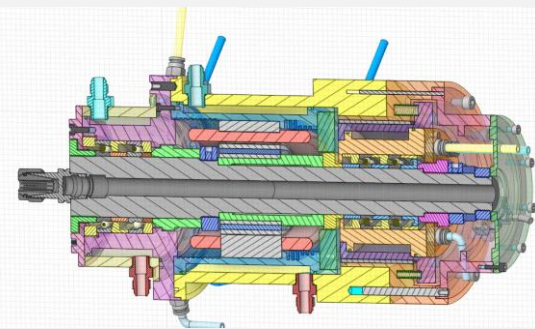- Mechanical interfaces in machine tools

Abrasive Process Modeling and Tool Development

- Comprehensive process modeling at the grit level
- Ground surface finish prediction
- Thermal modeling and surface burn avoidance
- Adaptive process optimization considering process constraints
- Optimized textured tool design through digital twin

Machine Learning Application for Autonomous Manufacturing

- Intelligent real-time process monitoring using ML
- Hybrid physics-based modeling enhancement by ML
- Machine learning-based process identification
- Fault detection using ML based hybrid monitoring system for unmanned manufacturing