

# UNITED TECHNOLOGIES RESEARCH CENTER — IRELAND\*



MAKING BETTER THINGS TO MAKE THINGS BETTER<sup>SM</sup>

United Technologies Research Center (UTRC) serves as the innovation hub of United Technologies (UTC)—developing new technologies and facilitating the transfer of technology and capabilities across the company.

UTRC ensures UTC's technological advantage in the market and solves the toughest scientific challenges for its customers.

UTRC has more than 600 global employees, representing more than 45 countries in five locations: its headquarters in East Hartford, Connecticut; Berkeley, California; Shanghai, China; Cork, Ireland; and Rome, Italy.

## UTRC IRELAND

The **Control and Decision Support group** supports UTRC Ireland's mission by bringing innovative, emerging, and disruptive technologies in related areas into United Technologies Corporation (UTC). The group develops algorithms and techniques in estimation, optimization and control, data analytics and machine learning to enable advanced capabilities, increased performance and resilience for the next generation of UTC products. The group's research focuses in three key strategic areas:

- Model-based control and optimization
- Machine learning and decision support
- Computer vision and video analytics

The **Networks & Embedded Systems group** works closely with UTC business units to enable the embedding of intelligence and connectivity in UTC products. Current areas of focus include:

- Heterogeneous embedded computing
- Wireless protocols for building and aircraft applications
- Formal verification methods
- Cyber Physical security
- Model-based system engineering
- Software technology and process

The **System Modelling and Optimization group** investigates and develops techniques for modelling, simulating and optimizing systems that are designed, manufactured, sold and serviced by UTC. The systems of interest range from integrated aircraft system architectures, to building thermal management systems and manufacturing facilities. The group's research focuses in three main areas:

- Physics-based modelling and simulation
- Discrete optimization and automated reasoning
- Aerospace system engineering

The **Power Electronics team** develops in close collaboration with UTC business units, new technologies in the field of power electronics and motor drives applied to elevators and refrigeration systems, as well as emerging needs for more electric aircraft. Current areas of focus include:

- Design of lightweight and compact power converters and drives
- Control of power converters, drives and actuators
- Modelling and design of electrical power distribution architectures.

## ABOUT UNITED TECHNOLOGIES

United Technologies (UTC) provides high-technology systems and services to the building and aerospace industries worldwide.

## UTRC IRELAND OVERVIEW

\*Founded in Cork in 2010 as 'United Technologies Research Centre Ireland, Limited', UTRC Ireland focuses on building energy and security, and aerospace systems.

UTRC Ireland's core technical capabilities are:

- Control and Decision Support
- Networks & Embedded Systems
- System Modelling and Optimization
- Power Electronics

UTRC's diverse staff includes some of the world's best scientific and engineering talent.

Approximately  
**80**  
employees

More than  
**70**  
technical employees

**63%**  
of whom hold Ph.D.s

From more than  
**20**  
countries worldwide



# UNITED TECHNOLOGIES RESEARCH CENTER — ITALY\*



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## UTRC ITALY

### Software Technologies

The Software Technologies group is responsible for advancing UTC's capabilities in elastic and smart middleware technologies (including XaaS, Fog, Edge, IoT) and providing deep domain expertise in software architecture. The group contributes to and leads innovative software engineering across UTC and the Research Center.

### Embedded Software & Networks, Simulation, Process and Method

The Embedded Software Group covers three disciplines:

- *Embedded Technologies & Networks*: Investigation of novel computational and communication platforms, smart sensing technologies.
- *CPS Simulation*: Exploitation of leading-edge simulation technologies for designing, testing and operating complex cyber-physical systems.
- *Method & Process*: Implementation of innovative model-based methodologies and processes to define and support design, validation and verification tool-chains of cyber-physical systems.

### System Analysis, Control & Optimization

The System Analysis, Control & Optimization group deploys advanced mathematical methods for the design and analysis of embedded controllers, physical systems and their interactions. This group is responsible for continuously innovating and improving UTC products through novel modeling techniques, data-driven profiling methods and advanced control systems.

### Formal Methods

The Formal Methods group investigates and develops methodologies and technologies for the validation and verification of UTC products leveraging mathematically founded algorithms. The developed methods enable the analysis of systems, software and hardware models, reducing development costs and increasing design quality and robustness. The group explores innovative and disruptive algorithms for methods deployment, development and delivery of standard processes and trainings for various UTC customers. The group currently focuses on five main technology areas: Requirements Analysis, Design Verification, Automatic Test Generation, Formal Safety and Cybersecurity Analysis.

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United Technologies (UTC) provides high-technology systems and services to the building and aerospace industries worldwide.

## UTRC ITALY OVERVIEW

\*Formed in Rome in 2012 with the purchase of a business renamed 'Advanced Laboratory on Embedded Systems Srl', UTRC Italy focuses on embedded and model-based systems engineering.

UTRC Italy's core technical capabilities are:

- Software technologies
- Embedded Software & Networks, Simulation, Process and Method
- System Analysis, Control & Optimization
- Formal Methods

UTRC's diverse staff includes some of the world's best scientific and engineering talent.

Approximately  
**42**  
employees

More than  
**36**  
technical employees

**55%**  
of whom hold Ph.D.s

From more than  
**3**  
countries worldwide

