charles river analytics

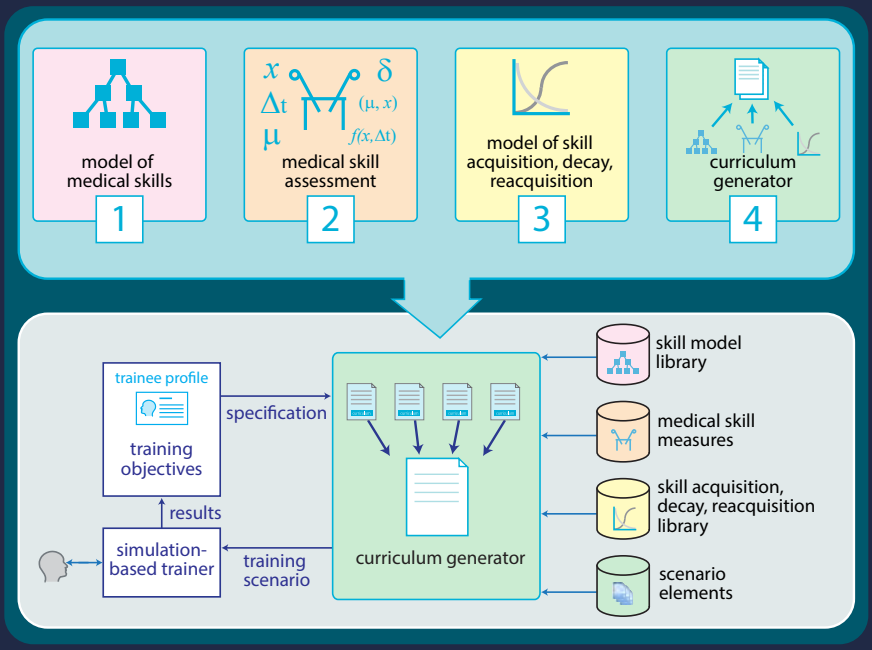
# Adaptive Intelligent Training

## What is adaptive intelligent training?

Adaptive intelligent training optimizes the learning process by:

- Adapting to individual needs. Training is tailored to an individual and progresses them as quickly as possible along their unique learning path
- Applying AI to make training more effective and efficient over time with scalable techniques

Our training platforms empower the individual and the organization to deliver peak performance.



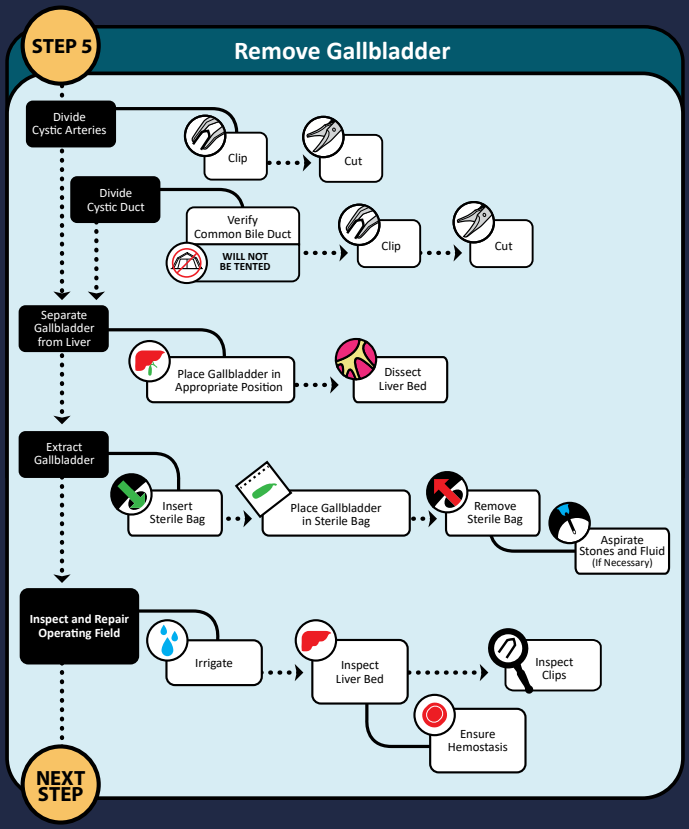

*Our medical training systems model and assess skill decay so clinicians can maintain critical skills.*

## What are the benefits of adaptive intelligent training?

Adaptive intelligent training lets you:

- Achieve a higher skill level across trainees in the same amount of time by holding training time constant
- Train groups faster when they have the same skill level by holding training criteria constant

With adaptive intelligent training, you can reduce training costs and improve skill levels across your organization.




*Annotated skill trees break down tasks into their component parts, including non-standard steps, repair steps, and technique variations.*

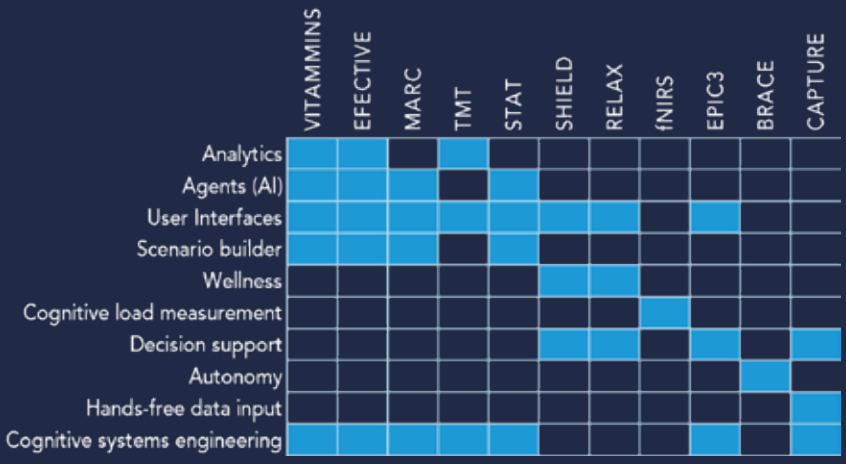
## Training features

Our training systems create adaptive intelligent training with:

- *Analytics* that characterize your simulation data
- *Agents (AI)* that act as virtual patients and teammates
- *Interfaces* that offer special capabilities, such as speech and XR
- *Scenario builders* that help you author and generate scenarios

We have applied our adaptive intelligent training to:

- *Wellness.* Our work integrates the latest psychological advances to help people be well
- *Cognitive load measurement.* We take our research out of the lab and into the field to measure cognitive load
- *Decision support.* Our projects help medical personnel make critical decisions that can save lives
- *Autonomy.* Our solutions have autonomy to keep humans out of harm's way
- *Hands-free data input.* Our hands-free data input solution automatically captures data during treatment so your personnel can focus on the patient, not data entry



## Projects

VITAMMINS. Virtual patient simulation and tutoring system for teaching and assessing trauma care skills

EFECTIVE. Comprehensive virtual environment for training medical and operational skills for austere, mass casualty environments

MARC. Augmented reality simulation of medical wounds to improve realism

TMT. Manikin accessory for classroom and field exercise tourniquet skill training

STAT. Multi-platform, screen-based practice environment for single-patient trauma care

SHIELD. Offers training exercises and self-assessments that help Marines cope with stress

RELAX. Helps Veterans improve anger management using cognitive behavioral therapy

fNIRS. Small, unobtrusive sensors that track measures of cognitive state

EPIC3. Helps medical personnel quickly and accurately predict traumatic injury and other patient outcomes

BRACE. Integrates proven sensing and autonomy capabilities into a modular hardware/software applique so platforms can safely evacuate combat casualties

CAPTURE. Hands-free interface that streamlines the capture of medical information

## Adaptive medical and patient care training: VITAMMINS

VITAMMINS classifies a medical professional's skill and adapts content to meet their learning needs as they progress through their training session. Medical professionals trained with the benefit of VITAMMINS skill models and adaptive training algorithms can deliver a higher quality of care.

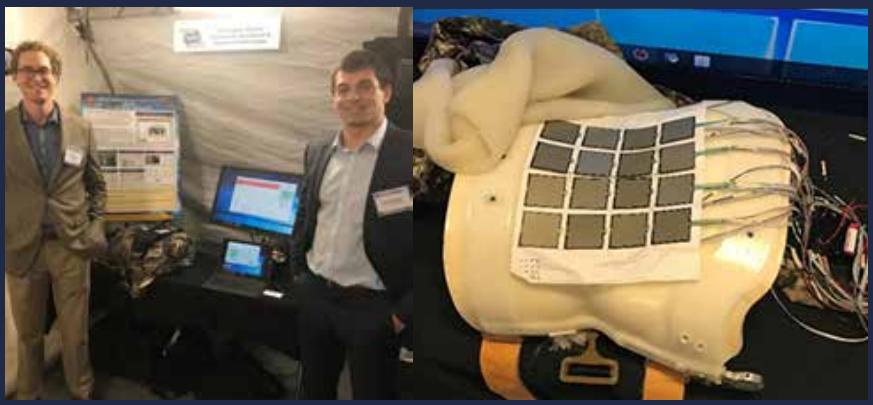

*The VITAMMINS medical simulation user interface was designed as a solution for the military medical domain, but is now used at Penn State to create scenarios and cues for trauma nurses.*

We worked with Professors Frank Ritter and Chris Garrison of Penn State to create detailed skill models using our MAST annotated skill trees to rapidly train deep knowledge about complex procedural skills, including challenges that medical personnel might face.

This detailed, adaptive training better trains medical professionals to meet the demands of tomorrow.

## Junctional tourniquet training: TMT

TMT allows pre-hospital medical providers to practice using junctional tourniquets on manikins, improving medical efficacy and reducing training costs.



*Charles River Analytics scientists demo TMT at the US Army Telemedicine and Advanced Technology Research Center's open house.*

TMT includes a sensor system linked to a virtual mentor that provides students with automatic, objective assessment and feedback during training. A mobile app offers students refresher training during deployment or when a manikin is not available for practice.

TMT works with multiple types of manikins and can adapt to future tourniquet technology advances.

*The Abdominal Aortic Junctional Tourniquet™ (Photo courtesy of Compression Works)*

## Trauma assessment training: STAT

With STAT, students learn the steps and concepts of trauma assessment so well that these procedures become second nature. After mastering our virtual training, students know what to do, when to do it, and can perform quickly when they face real-life medical emergencies.

*STAT's Moulage Kit in active use at the Penn State College of Nursing Simulation Lab, where it creates realistic medical imagery to train trauma nurses. Photo courtesy of Chris Garrison.*

We teamed with Professor Frank Ritter of Penn State to develop STAT, our computer- and tablet-based trauma care assessment solution. STAT provides an interactive virtual patient so students can transfer the skills they learned in the sim center to real-life medical scenarios.

With Penn State's D2P2 tutoring architecture, we used STAT to create an intelligent Trauma Nurse Tutor for the US Air Force.

*A virtual patient presented in STAT's user interface*

## Training procedures in context: EFECTIVE

EFECTIVE is the DoD's first comprehensive virtual system to train the personnel that support medical missions. We adapted it to train civilian personnel responding to mass casualty incidents. EFECTIVE lets a student safely visit—and revisit—a challenging environment, better preparing medical professionals for real-world scenarios.

*High-level view of a scenario developed in EFECTIVE. The student is playing from the perspective of the Senior Medic, directing helper medics, allocating resources, and interpreting mission requirements to make decisions about casualty care.*

EFECTIVE captures important decision-making themes based on existing policies and the past experience of military medical personnel. The simulation automatically assesses student proficiency against objective performance metrics linked to these themes.

EFECTIVE also integrates with VIRTUOSO, our XR software development kit, to support training peripherals, such as VR headsets and physiological sensors.

## Tactical combat casualty care training: MARC

MARC provides augmented reality (AR), in-situ, tactical combat casualty care training and assessment during live, force-on-force training.


*Medics provide mock medical treatment to a live actor patient in a treatment tent (left). MARC's AR uses real-time human pose estimation and wound rendering to make training more realistic (right).*

An ongoing US Army study, Squad Overmatch-TC3, found that Warfighters lack access to realistic tactical combat casualty care (TC3) simulations. MARC addresses this gap with commercially available AR technologies that portray realistic, virtual wounds overlaid on live actor patients.

Our MARC simulation technology offers organizations a cost-effective and realistic alternative to staid classroom exercises. MARC better equips medics with the skills they need to simultaneously manage combat and lifesaving interventions.

*To learn more about how we can work with you, email contactus@cra.com.*

**Charles River Analytics** conducts cutting-edge AI, robotics, and human-machine interface R&D to create custom solutions for your organization. Our customer-centric focus directs us towards problems that matter, and our passion for science and engineering drives us to create actionable, impactful solutions.

We were founded in 1983 to perform results-focused research for the US government. We became an employee-owned company in 2012, setting the stage for the next generation of innovation, service, and growth. Today, our over 200 employees make a difference for a "who's who" in government and industry by delivering results on government programs and working with commercial partners.

We come to work every day because we want to advance technology to solve today's hardest problems. Our track record speaks for itself—our implemented solutions enrich the diverse markets of defense, intelligence, medical technology, training, transportation, space, and cyber security. We owe our success to our expertise in advanced algorithms, machine learning, autonomous systems, advanced human-system interfaces, agile software and hardware engineering, and to our enduring base of knowledgeable customers.

At **Charles River Analytics**, we turn research into results.

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ADAPTIVE INTELLIGENT TRAINING