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Markets

Computer predicts sports injuries

The ink was barely dry on Fernando Redondo's multi-million dollar contract with the soccer powerhouse AC Milan when the player blew out his knee just three minutes into a routine workout on a treadmill. His pain was felt acutely by team owners, who were left to wonder how this might have been foreseen — and prevented.

FOR YEARS team doctors and coaches have looked for crystal balls that would show ACL injuries in the making, soothsayers who could hold forth on hamstrings that might blow, genies that could warn of a rotor cuff about to explode in the new hot prospect's shoulder.

AC Milan may have found such an oracle: a computer smart enough to recognize the signs of an athlete coming apart. The renowned Italian soccer club — which has four players competing in this year's World Cup — has teamed up with Computer Associates International to test the feasibility of using neural networks, a form of artificial intelligence, to predict injuries and optimize conditioning for each athlete, perhaps even to help select which players to sign.

NEURAL NETWORKS

Neural networks are different from traditional computers in that they "learn" to recognize patterns instead of being given a set of rules in the form of a computer program. So, in the case of sports injuries, the neural network is "shown" many cases of athletes who have been injured. The computer is fed data on each player's performance and habits in the weeks and months prior to the injury.

Jean Pierre Meersseman, the head of AC Milan's medical team, provided a bit more insight into the process. Players are asked to wear sensors — about 18 to 24 of them — on their bodies during workouts. The sensors transmit information back to the neural network via radiowaves. This way the computer gets feedback while the athlete plays soccer, runs a 40-meter dash or works out on the machines in the AC Milan gym.

The computer also is fed psychological data, as well as information on what each player eats.

PROMISING RESULTS

An 18-month test of the system gave promising results, according to Aliberti. "We were able to run the test because [AC Milan] had a lot of data on its athletes already," he said.

The pilot program showed that injury prediction was a possibility, Meersseman said. "We had information from more than 5,000 tests on our players done over the last four years," he explained. "We put this into the network to see if certain parameters changed before a player was injured."

Ultimately the neural network correctly predicted injuries 84 percent of the time, Meersseman said. "The mathematicians think they can get this number up to 96 percent," he added. The new system could be a great help to coaches trying to predict which players are at risk, said Dr. Arthur Bartolozzi, chief of sports medicine at the Pennsylvania Hospital in Philadelphia. "A lot of factors can contribute to injury: conditioning, fatigue, equipment, weather conditions, surface conditions," Bartolozzi said.

If a system could be developed to take all of these things into account, it might allow team doctors to pull players before they get injured, he added. "Right now we've got pretty rudimentary tools to predict injuries with," he said. "It would be nice to have tools that would allow us to see more subtle abnormalities."

The program might also have saved AC Milan a lot of money, had it been around when the team was bidding for Fernando Redondo. "We spent an enormous amount of money buying a player who got hurt after three minutes on the treadmill," Meersseman said. "Maybe we would have thought twice about buying him. Maybe the price would have been different."

And if the team had gone through with the deal anyway, the neural network might have told them how to avoid the big injury. "Once we buy a player we should be able to monitor him to see if his condition is declining," Meersseman said. "Then we could adapt the training schedule."

If the new technology turns out to be everything promised, it could make things more accurate — and thus fairer — for athletes, Bartolozzi said. Right now, before signing a new player, doctors and coaches do their best to predict whether a player will stay healthy.

But the assessment is "in many ways unscientific," he said. The new system might allow teams to make a more accurate determination of a player's future fitness, he added.

Beyond that, Bartolozzi said, "It's very intriguing to be able to study players in real time."

Bartolozzi sees other possible uses of the new technology. "We might be able to use it to figure out the differences in injury rates between male and female athletes," he said. "Now that more girls are playing soccer and other sports, we're seeing more of them tearing their ACLs. This might help us explain the sex difference."

When it comes to predicting injuries, ultimately, the neural networks may simply give validity to what team doctors often know intuitively. "If I think I see something wrong with an athlete and can't say exactly what it is, it's hard to tell the coach to not use a player," Meersseman said. "He wants the player to play if there's nothing really wrong. I hope now I'll have the numbers to say how much possibility there is that this player will be injured. It will give a little more power to what I say."

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