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National University of Food Technologies

92th
International scientific conference
of young scientist and students

"Youth scientific achievements
to the 21st century nutrition
problem solution"

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Part 2

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The publication contains materials of 91th International scientific conference of young scientists and students "Youth scientific achievements to the 21st century Nutrition problem solution".

It was considered the problems of improving existing and creating new energy and resource saving technologies for food production based on modern physical and chemical methods, the use of unconventional raw materials, modern technological and energy saving equipment, improve of efficiency of the enterprises, and also the students research work results for improve quality training of future professionals of the food industry.

The publication is intended for young scientists and researchers who are engaged in definite problems in the food science and industry.

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Матеріали 92-ї Міжнародної наукової конференції молодих учених, аспірантів і студентів "Наукові здобутки молоді – вирішенню проблем харчування людства у XXI столітті", 20–24 квітня 2026 р. – Київ: НУХТ, 2026. – Ч.2. – 499 с.

Видання містить матеріали 91-ї Міжнародної наукової конференції молодих учених, аспірантів і студентів "Наукові здобутки молоді – вирішенню проблем харчування людства у XXI столітті".

Розглянуто проблеми удосконалення існуючих та створення нових енерго- та ресурсощадних технологій для виробництва харчових продуктів на основі сучасних фізико-хімічних методів, використання нетрадиційної сировини, новітнього технологічного та енергозберігаючого обладнання, підвищення ефективності діяльності підприємств, а також результати науково-дослідних робіт студентів з метою підвищення якості підготовки майбутніх фахівців харчової промисловості.

Розраховано на молодих науковців і дослідників, які займаються означеними проблемами у харчовій науці та промисловості.

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Development of a modern CNN-based model for detecting packaging defects at a dairy production enterprise

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Introduction. Step inside the Yagotynsky Butter Plant and the first thing you notice isn't the technology, it's the speed. Thousands of units of milk, sour cream, and that famous butter fly across the conveyor belts every hour. When things move that fast, mistakes happen. A label goes on crooked. A plastic seal doesn't quite close. A date stamp comes out as a smudge. For years, we relied on people to catch these slips, but let's be honest: after four hours of watching white cartons zoom past, anyone's eyes start to play tricks on them. Fatigue is real, and it's the biggest enemy of quality. This is why we are looking at Convolutional Neural Networks (CNNs). We don't need a "revolutionary paradigm shift"; we just need a digital eye that doesn't get tired and doesn't blink.

Materials and methods. The big question is why this is so hard to automate in the first place. We need something smarter. By using a CNN, we aren't writing a manual of rules for every possible mistake. We are basically showing the computer thousands of photos of what "good" looks like and what "bad" looks like. It's more like training a new apprentice than writing a computer program.

Results and discussion. Building this system isn't just about sitting in a quiet office and writing code. And the data we use to teach the model has to be "ugly." We shouldn't just show it perfect studio photos. We need to show it images with shadows, blur, and condensation-the exact things it will actually see every Tuesday morning at 3 AM on the production line.

Then there is the issue of speed. The butter lines at Yagotynsky don't wait for anyone. If the neural network takes two seconds to "think" about a package, the line has already moved ten meters down the hall. This is why we lean toward architectures like YOLO. It's fast. It looks at the whole image once and makes a call.

We don't need the most complex, massive model ever built; we need one that is lean enough to run on a small industrial computer tucked under the conveyor belt. This is "edge" computing in action. By processing the images right there on the spot, we can trigger a mechanical arm to flick a bad carton off the line before it ever gets near a shipping crate. When the AI starts seeing a pattern-say, twenty crooked labels in a row-it shouldn't just toss them out. It should send a ping to the technician's tablet. "Hey, check the glue on Machine 4." That turns a simple "defect detector" into a tool that actually helps the staff do their jobs better. It stops the waste before it even happens.

Conclusion. In the end, putting a CNN on the dairy line is about one thing: trust. People buy Yagotynsky products because they know what they are getting. A single leaky milk carton or a butter wrap with a hole in it can ruin that reputation in a second. By using these neural networks, we are just adding another layer of armor to that brand promise. It's a practical, gritty solution to an old-school industrial problem. We are taking some of the most advanced math available today and putting it to work in a room that smells like fresh cream and humming motors. It's not science fiction; it's just the next logical step in making sure that when someone opens a pack of butter, it's exactly as perfect as they expected.