

# Exploration of Construction of Digital Image Processing Course for Postgraduates under the Background of New Engineering Course

Ling Qiu<sup>1</sup>, Mingju Chen<sup>2,\*</sup>, Xiao Hu<sup>2</sup>

<sup>1</sup>*School of Computer Science and Engineering, Sichuan University of Science & Engineering, Yibin, Sichuan, China*

<sup>2</sup>*School of Automation and Information Engineering, Sichuan University of Science & Engineering, Yibin, Sichuan, China*

*\*Corresponding Author.*

**Abstract:** At present, postgraduate education generally attaches importance to the cultivation of professional knowledge and scientific research skills, while Ethical education is relatively weak and needs to be improved urgently. This paper discusses the importance and methods of strengthening the elements of Ethical education in the course of Digital Image Processing under the background of graduate education, and puts forward a variety of teaching strategies, including defining the teaching objectives, constructing the Ethical teaching system, establishing case base and carrying out engineering practice projects, aiming at improving students' social responsibility and innovation ability. By guiding students to analyze the application of technology and ethical issues, we can cultivate their awareness of professional ethics, so as to promote the development of students' technical ability and social responsibility, and cultivate high-quality digital image processing talents with all-round development.

**Keywords:** Digital Image Processing; Electronic Information; Construction of Ethical Education; Teaching and Problem-Based Learning; Case Construction

## 1. Introduction

At present, postgraduate education focuses on students' learning of the frontier knowledge of disciplines and mastering of scientific research skills, and theoretical and practical teaching focuses on training postgraduates' professional knowledge, while Ethical education is relatively weak [1-2]. Strengthening the ethical

construction of postgraduate courses and improving the Ethical education system are the inevitable requirements for speeding up the reform and development of postgraduate education in the new era. In recent years, colleges and universities across the country have actively responded to the requirements of the times, and electronic information majors have carried out Ethical construction in their professional courses. For example, there is a lot of research on Ethical education in basic courses such as advanced algebra [3-4] computer foundation [5-6] and signal processing [7-8], but the research on Ethical education reform in core professional courses such as artificial intelligence, machine vision and digital image processing is still relatively weak, especially in the postgraduate stage.

Postgraduate education is different from undergraduate education. Master's education is to cultivate high-level applied professionals, emphasizing the close combination of academic and professional, and emphasizing the cultivation of professional technology or practical innovation ability [9-10]. The course of digital image processing mainly teaches the basic principles, typical methods and application practice of computer image processing. This course is a course that pays equal attention to both theoretical study and hands-on practice. It is directly related to the specific application of daily life and industrial production, and is widely used in aerospace, transportation, communications, meteorology, medicine and other fields.

At present, the teaching mode of digital image processing is still based on classroom teaching, teachers explain relevant theories and knowledge with the help of slides, and the

textbooks of digital image processing also focus on professional knowledge, which leads to the strong theory and poor application of classroom teaching, students' learning enthusiasm is not high, and the ability to combine theory with practice can not be exercised. The teaching reform of digital image processing course not only needs to pay attention to technology updates, but also should pay attention to the importance of the ethical course. At present, the field of digital image processing is changing with each passing day, and new technologies and applications are emerging in an endless stream. However, courses often focus only on the technical level, ignoring the cultivation of students' values and social responsibility [11-13]. In the process of teaching, teachers should guide students to understand the application of digital image processing technology in society, especially the ethical issues in the fields of media communication, public safety and privacy protection.

By introducing the Ethical concept of the course, students' awareness of professional ethics and social responsibility can be enhanced, so that they can not only have solid technical ability in future engineering applications, but also treat and solve practical problems with a responsible attitude. This combination not only helps to stimulate students' interest in learning, but also improves the interaction and practicability of the classroom. Let students think about the relationship between technology and society in practice, and ultimately cultivate digital image processing talents with comprehensive quality, which meets the requirements of the new era for professionals.

**2. Main Methods of Ethical Construction of Digital Image Processing Course**

Digital Image Processing is the core course of electronic information specialty for master's research, whose teaching goal should not only be devoted to imparting professional knowledge and skills, but also be integrated into Ethical education, so as to cultivate students' social responsibility and innovative ability in an all-round way. This paper will discuss how to effectively integrate the ethical concept into the teaching process of Digital Image Processing by defining the teaching objectives of Digital Image Processing,

constructing the teaching system and practical cases.

**2.1 Teaching Objectives of Digital Image Processing Integrated into Ethical Court**

The teaching objectives of the "Digital Image Processing" course with ethical education are shown in Table 1.

**Table 1. Teaching Objectives of Digital Image Processing**

Course objectives	
Professional objectives of the course	1. Make clear the focus of the ethical content of the course of Digital Image Processing; 2. Establish the ethical teaching method of the course of Digital Image Processing; 3. Combine the characteristics of electronic information and control science and engineering specialty to establish the teaching system of ethical education of Digital image processing course; 4. Enhance teachers' ethical awareness and ability in the teaching of Digital Image Processing, and integrate ethical education into the whole process of classroom teaching construction; 5. Construct typical cases of ethical education in Digital Image Processing, and realize the innovation of ethical Education in Digital Image Processing.
The goal of curriculum education	1. Improve students' ability to correctly understand, analyze and solve problems; 2. Cultivate students' sense of responsibility and mission to explore the unknown, pursue truth and bravely climb the peak of science; 3. Cultivate students' great scientific research spirit of excellence, and stimulate students' national feelings and mission of serving the country through science and technology;

**2.2 Outline of Ethical Education for Postgraduate Course of Digital Image Processing**

Combing the ethical education elements

contained in the course of Digital Image Processing, providing reference for the compilation of the syllabus of professional courses with ethical connotations, the organic integration of professional education and ethical education, and taking this as a standard,

building the supporting matrix of digital image processing curriculum system for ethical education objectives and digital image processing practice. As shown in **Table 2** and **Table 3**.

**Table 2. Supporting Matrix of the Curriculum System of Digital Image Processing to Ethical Education Objectives**

		Cultural Inheritance of World Consciousness	Feelings of Home and Country and Responsibility	Theoretical and technical analysis ability	Craftsman's spirit and professional accomplishment	Innovative ability of engineering thinking	The college is proud of its professional ownership.
Digital image processing	Discussion class		•	•			•
	Curriculum Connotation and Development	•	•				•
	Master of Digital Image Processing Science			•	•	•	
	Great Projects Tour and Discussion		•	•		•	
	Creative Thinking and Engineering Science Training				•	•	
	Case Analysis and Discussion of Major Projects		•		•		
	Engineering Synthesis and Its Social Impact Analysis		•	•	•		
Theoretical knowledge					•	•	
Engineering application ability		•	•				

**Table 3. Supporting Matrix of Practical Teaching of Digital Image Processing to Ethical Education Objectives**

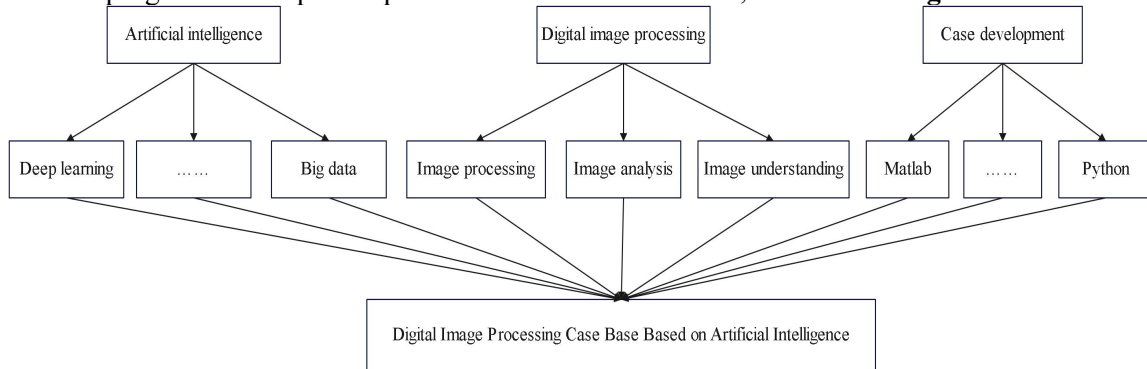
	Cultural Inheritance of World Consciousness	Feelings of Home and Country and Responsibility	Theoretical and technical analysis ability	Craftsman's spirit and professional accomplishment	Innovative ability of engineering thinking	The college is proud of its professional ownership.
Practice programming	•	•	•			•
Theory and practice		•	•			•
Classic case		•	•			
Practical application		•	•		•	•
Excellent intelligence	•	•	•	•	•	•
Hotspot technology		•	•	•	•	•
School-enterprise communication	•	•	•	•	•	

Professional planning	.	.	.	.	.	.
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**2.3 Establish a Typical, Cutting-edge and Applied Case Base for the Course Digital Image Processing**

The purpose of case construction is to apply theoretical knowledge to solve application problems, to establish a typical, cutting-edge and applied course case base, to stimulate graduate students' interest in learning digital image processing, and to cultivate students' ability to solve engineering application problems. Integrating the current intelligent information processing technology and digital image processing course case construction, using MATLAB, OpenCV, VC ++, Python and other program development platforms to

realize artificial intelligence and digital image processing algorithms, the digital image processing case construction framework integrated with artificial intelligence is constructed. Based on the existing digital image processing cases, the cutting-edge intelligent information processing technology is introduced to optimize the existing low-level cases of image processing, and the medium and high-level cases of image analysis and image understanding based on the cutting-edge technology of artificial intelligence are constructed to solve the shortcomings of the medium and high-level cases of digital image processing, so as to enrich the teaching resources, as shown in **Figure 1**.



**Figure 1. Construction Route of Digital Image Processing Case Base**

**2.4 Developing Case Design Teaching in the Second Classroom**

The case teaching of digital image processing engineering in the second classroom is carried out to create conditions for the further development of graduate students. With digital image processing cases as the carrier, combined with cutting-edge intelligent information processing technology, the idea of theoretical innovation and practical innovation is practiced [14]. Students are guided to use artificial intelligence technology to solve digital image processing problems from the perspective of engineering application, develop related image processing products, and form patents, papers and other scientific and technological achievements.

**2.5 Mining and Analysis of Ethical Elements in Curriculum**

Through the combination of the course content of Digital Image Processing and social

responsibility, students can be encouraged to analyze the application of technology in medicine, environmental protection and other fields, and explore the ethical issues it brings [15]. Through case studies, interdisciplinary lectures and project-driven learning, students are guided to apply their knowledge to practical problems and enhance their sense of social concern and responsibility. The integration of ethical elements in the "Digital Image Processing" course is shown in **Table 4**.

**2.6 Ethical Teaching Design of Digital Image Processing Course**

The ethical teaching design of Digital Image Processing should focus on cultivating students' sense of social responsibility, innovative ability and critical thinking ability, looking at technological development and social problems from a more comprehensive perspective, and providing a more solid foundation for their career development.

Selection and setting of teaching materials:

select teaching materials suitable for ethical education, which can include professional theoretical knowledge, examples, ethics, social responsibility and other aspects. In the setting of teaching materials, we can pay attention to

the combination of technical knowledge with ethics and social impact, so that students can think about the values and social problems behind it while learning technology.

**Table 4 Mining of Ethical Elements in Digital Image Processing Course**

Key points of teaching	Excavation of ethical elements	Teaching form and teaching method	Effectiveness analysis
1 History of Digital Image Processing	Celebrity anecdotes in image processing technology and application cases of QR Code.	Stories, videos, cases, etc.	Stimulate students' continuous exploration of knowledge, highlight China's leading achievements in this field, and enhance students' cultural self-confidence.
2 Basic Technology of Digital Image	The spectral range and imaging characteristics of digital image signals, China's leading position in the field of terahertz research.	Principle demonstration, pictures and famous sayings	Educate and encourage students to work hard and climb the academic peak bravely.
3 Histogram Transformation and Image Filtering	For the specific application of image enhancement in spatial domain, the classical algorithm of image defogging is taken as an example.	Scientific research paper introduction, algorithm demonstration, etc.	He Kaiming, the inventor of the classic image defogging algorithm, explains the important developments in image processing and video analysis in China in recent years, and cultivates students' spirit of daring to challenge and catch up with the academic frontier.
4 Principles of Bandpass and Bandstop Filters	Application of Remote Sensing Image Processing	Introduction of news information, Beidou and Mars rover	This paper reviews the rapid development of space remote sensing technology in China, and cultivates students' patriotism and scientific research spirit.
5 Image Degradation Model and Restoration Technology	Application and Significance of Image Restoration Technology in National Life and Military Field	Case presentations, military stories, etc.	From the restoration of old photos and deformed images in life, the effective restoration and identification of weak targets in the military field can cultivate students' sense of social responsibility and dedication.
6 Pseudo-color image processing technique	Application during epidemic prevention and control (automatic identification and labeling of people with high body temperature by using pseudo-color processing technology)	Algorithm demonstration, application introduction, etc.	With a series of advanced examples during the epidemic prevention and control period in our country, we can show students the superiority of social institution and the cohesion of the people of the whole country in fighting against the epidemic and uniting as one, and cultivate students' patriotism and national pride.
7 Digital watermarking technology	Effective guarantee of intellectual property rights	Case demonstration, introduction of property rights violations, etc.	Through the specific application of digital watermarking technology, students are educated in the concept of legal system.
8 Geometric transformation of image	This paper introduces the evolution of projective geometry and deduces the space transformation relationship.	Examples in life, analysis of the reasons for change	Let students experience the relationship between basic courses and professional courses in the process of discovering, analyzing and solving problems, and cultivate students' scientific thinking mode.
9 3D reconstruction technology	While introducing the concept of three-dimensional reconstruction, we select the legends and materials with Chinese culture to carry out three-dimensional reconstruction.	Cases and historical stories of the reconstruction of historical and ancient buildings.	Choose legends and materials with Chinese culture for three-dimensional reconstruction to show our long history and stimulate students' cultural self-confidence and patriotic enthusiasm.
10 Engineering application case, intelligent cutting of recycling compressor	Green and sustainable development, effective recovery and utilization of energy	Case presentation, intelligent equipment introduction, robot development, etc.	Combining with the social background of sustainable development and effective use of energy advocated by the state, students can cultivate their practical ability and scientific and technological innovation consciousness through practical engineering cases.

Setting of curriculum objectives: to clarify the objectives of ethical education, such as cultivating students' critical thinking ability,

social responsibility and ethical awareness. Ensure that the curriculum is aligned with the objectives and that the assessment examines

the extent to which students are meeting these objectives.

**Course content organization:** In the teaching content, professional knowledge, ethics, social responsibility and other contents are organically combined. Through case analysis, discussion and debate, students can be guided to think about the impact and negative effects of technology, so as to deepen their understanding of digital image processing technology.

**Classroom teaching methods:** use a variety of teaching methods, such as teaching, case analysis, discussion, group activities, practical operation, etc. Through active student participation, we can promote the collision of ideas and the deepening of thinking. To guide students to think about the ethical, legal and social issues of digital image processing technology from different perspectives, and to cultivate their values and critical awareness.

**Extracurricular development and practice:** arrange relevant extracurricular development activities, such as visiting relevant enterprises or research institutions, holding lectures, seminars and other academic activities, and encourage students to actively participate in social practice and scientific research projects. These activities can help students understand the application and social impact of technology in depth, and develop their innovative ability and social responsibility.

**Assessment method design:** The content of ethical education is considered to be included in the assessment, which can be evaluated comprehensively by means of classroom performance, group discussion, project report, special speech, etc. At the same time, it pays attention to quality and process evaluation, and pays attention to students' ability to think and express technological ethics and social issues.

## 2.7 Teaching Implementation and Methods

The implementation of ethical education in the course of Digital Image Processing needs to combine the requirements of professional knowledge and ethical education. The following are some commonly used ethical teaching methods:

**Combining theory with practice:** When teaching the theoretical knowledge of digital image processing, we should pay attention to the combination of practical cases and practical operation, so that students can

understand and apply the knowledge they have learned through practical operation, and guide students to think about the impact of the technology on society and social responsibility.

**Guided discussion and debate:** Through classroom discussion and debate, students are guided to explore issues such as ethics, social impact and legal norms in the field of digital image processing. It can raise some controversial issues, stimulate students to think and put forward their own views, and promote pluralistic thinking and active participation.

**Case teaching:** Select relevant digital image processing cases, guide students to analyze the ethical issues, technical challenges and social impacts in the cases through explanation and discussion, and cultivate their reflective ability and sense of social responsibility.

**Social practice and research activities:** organize students to participate in practical activities and social research related to digital image processing, so that they can experience the reality of technology application, and analyze and evaluate the impact of research results on technology development, so as to improve students' social awareness and critical thinking ability.

**Resource integration and special lectures:** integrate relevant social resources, invite experts, scholars and industry practitioners to give special lectures, so that students can deeply understand the cutting-edge technology, industry development status and social applications in the field of digital image processing, and help students broaden their horizons and update their concepts.

**Interdisciplinary and comprehensive practice:** Interdisciplinary with other disciplines, such as ethics, law and other disciplines, to carry out comprehensive practice projects to guide students to explore the application and limitation of digital image processing technology in social ethics and legal norms.

## 3. Main Features and Results

### 3.1 Constructing a Scientific and Reasonable Ethical Goal Support Matrix System of Digital Image Processing Course for Postgraduates Majoring in Control and Electronic Information

Digital image processing involves many research directions, including image inpainting

education, image enhancement, image compression, image recognition and so on. Because the training objectives of different research directions have different requirements for the teaching objectives and teaching contents of the course, the ethical elements and objectives of different research directions are also different, which requires that each research direction of digital image should focus on different ethical standards according to the formulation. To determine the support matrix of digital images for cultural identity, national consciousness, social responsibility, cultural self-confidence, sound personality and other ethical objectives.

### **3.2 Constructing the Ethical Teaching Content System of Digital Image Processing Course with Complete Elements**

Based on the knowledge and skills of digital image processing, the teaching design of ethical course of digital image processing constructs a teaching plan content system consisting of educational objectives, professional knowledge points, ethical integration points, educational elements, method innovation points and teaching reflection points. Teachers guide students to explore the influence and role of digital image processing in social development, as well as the ethical and social responsibility of digital technology. By analyzing relevant cases and thinking about relevant issues, students can understand the relationship between technological innovation and social progress, understand the privacy protection, information security and ethical issues involved in digital image processing, and realize their responsibility and impact on society as technical talents.

### **3.3 Constructing the Teaching Scene of Digital Image Processing Course Guided by the Value of Various Teaching Means**

By using various methods such as theoretical hierarchical teaching, case narrative communication, focus discussion and reflection, engineering exercise promotion, action learning change and so on, patriotism, national pride, cultural self-confidence, striving spirit and national policy are integrated into the specific content and various links of professional curriculum teaching. Through diversified teaching methods and

teaching forms, we can cultivate students' multiple thinking and innovative ability, guide students to pay attention to the guidance and practice of values in the field of digital image processing, and exercise students' team cooperation and problem-solving ability through interaction and cooperation. Such a teaching scenario will help students develop in an all-round way and prepare for future academic and career development.

### **3.4 Integrate into social hot spots and ethical issues**

Combining with the current social hot spots and ethical issues, such as face recognition technology, digital watermarking and so on, let students think about the impact of scientific and technological development on personal privacy, social ethicality and fairness and justice, and guide them to form an independent and responsible attitude. Students are guided to think about the ethical challenges and social implications behind these issues, as well as the conflicts between different stakeholders. Through discussion and case analysis, students can learn about the social problems that may arise from the development of digital image processing technology, and think about how to solve these problems through ethical principles.

### **3.5 Realization of Case-driven Theory Teaching and Experiment Teaching**

It adopts the teaching method of combining teaching materials with cases, introducing practice into theoretical teaching, interspersing theory in practical teaching, and demonstrating cases and analysis through cases. Theoretical knowledge is explained throughout the whole process of case analysis, and knowledge imparting is presented to students in the form of cases, which is convenient for students to understand the main points of knowledge. Experimental teaching pays attention to the cultivation of engineering practice ability, constructs targeted, engineering and application-oriented experimental content, so that students can use cutting-edge technology to solve practical engineering problems, thus realizing the spiral teaching process of theory-practice-engineering. Students are encouraged to actively participate in social discussions and activities, focusing on the ethical issues of digital image processing technology. Students

can enhance their understanding and thinking of hot social issues by participating in social seminars, writing papers or participating in practical projects.

### 3.6 Promoting the Transformation and Innovation of Ethical Teaching Discourse System of Digital Image Processing Course and Promoting Value Orientation

The ethical discourse of the course of Digital Image Processing is embedded into the value orientation of professional knowledge, and the expression of professional discourse is reformed to better implement the educational policy and cultivate students' core values. Starting from the aspects of curriculum content, teaching methods and textbook selection, the core values are integrated into the curriculum. Teachers can guide students to think about the social impact and ethical value of digital image processing technology through case analysis, discussion, debate and other forms, and play the main role of students to cultivate their value judgment ability and critical thinking ability. Organize students to participate in social welfare projects, use digital image processing technology to improve social problems, and cultivate students' sense of social responsibility.

### 4. Conclusion

In view of the current postgraduate education, the cultivation of professional knowledge and scientific research skills is excessively strengthened, and the ethical education is neglected, which restricts the development of students' overall quality. This paper puts forward the methods of integrating ethical ideas into the teaching of professional courses, improving students' professional knowledge and practical ability, and guiding them to establish correct values and social responsibility.

In the specialized course of Digital Image Processing for graduate students, through the clear curriculum objectives, teaching content and diversified teaching into the ethical content of the course, the introduction of social hot spots and ethical issues in teaching, so that students not only have a solid technical ability, stimulate students' interest in learning and innovative consciousness, but also enhance students' sense of social responsibility. To contribute to the progress of the country and

society. Future research should continue to explore the application of ethical courses in more professional fields in order to form a more perfect postgraduate education system and provide strong talent support for the development of science and technology and social progress in China.

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