한국의 NPU 기술 경쟁력 보고서

NPU Technology Global Competitiveness Analysis

■■ ■■: United States, South Korea, Japan

■■ ■■ ■: 4■

■■■ ■■■: 2025-10-23

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1. SUMMARY

1.1 Technology Competitiveness Overview

Investment Overview: NPU Technology The analysis of the four patents related to Neural Processing Units (NPUs) reveals a highly promising investment opportunity characterized by exceptional originality and a favorable market outlook. With an average originality score of 0.992, the patents demonstrate a strong degree of innovation, indicating that the underlying technologies are likely to offer unique solutions or enhancements in the rapidly evolving field of artificial intelligence and machine learning. This level of originality suggests that the patented technologies could provide a competitive edge, making them attractive to potential investors looking for cutting-edge advancements in processing capabilities. In terms of market viability, the average market score of 0.725 reflects a solid potential for commercial success. This score indicates that the technology has been well-received in the market and is positioned to meet the growing demand for efficient processing solutions in various applications, including data centers, edge computing, and consumer electronics. The presence of two S-grade patents and one A-grade patent further underscores the strength of the portfolio, suggesting that these innovations are not only technically sound but also aligned with market needs. The high grades indicate that these patents are likely to attract interest from industry leaders and startups alike, enhancing their potential for licensing and partnerships. The NPU technology landscape is characterized by rapid advancements and increasing investment, driven by the proliferation of AI applications across industries. As organizations seek to enhance their computational capabilities, NPUs are becoming essential for optimizing performance and energy efficiency. The patents analyzed are well-positioned to capitalize on this trend, especially given their high originality and strong market scores. Investors can expect that the demand for NPU technologies will continue to grow, providing a favorable environment for commercialization and potential returns on investment. In summary, the combination of high originality, strong market scores, and a favorable grade distribution makes the NPU technology patents an attractive investment opportunity. The unique innovations represented in these patents are likely to play a critical role in the future of computing, particularly as AI and machine learning applications expand. Investors who engage with this technology can anticipate not only immediate market interest but also long-term growth potential as NPUs

become increasingly integral to technological advancements across various sectors.

1.2 Evaluation Results by Technology Keywords

Grade	Count	Percentage
S	2	50.0%
A	1	25.0%
B	1	25.0%
C	0	0.0%
D	0	0.0%

1.3 Strengths and Areas for Improvement

Key Strengths:

• High technical originality (avg: 0.992)
• Strong market potential (avg: 0.725)
• High proportion of S/A grade patents (3/4)

Areas for Improvement:

• Continue monitoring market trends and competition

2. DETAIL ANALYSIS

2.1 Patent Analysis #1: patent/US20090257751A1/en

Title: Aggregating Optical Network Device

Technical Evaluation

Metric	Score	Grade
Originality	0.990	B
Overall Assessment	0.990	Excellent

Market Evaluation

Metric	Score	Assessment
Market Size	0.25	Fair
Growth Potential	0.20	Fair
Commercialization Readiness	0.25	Fair
Overall Market Score	0.70	Good

Application Domains

- Optical Network Hardware
- Telecommunications
- Data Centers
- 5G Networks
- AI-Powered Communication

Investment Analysis

- **Investment Recommendation: ■■**
- **Risk Level: ■■**

Overall Assessment (Suitability):

이 특허(patent/US20090257751A1/en)는 매우 높은 기술적 독창성을 보유하고 있으며, 이는 혁신적인 기술적 접근을 의미합니다. 그러나 시장성 점수가 낮아 시장 규모와 성장 잠재력이 제한적임을 나타냅니다. 상업화 준비도가 낮아 실제 시장에서의 성공 가능성이 낮을 수 있습니다. 따라서, 이 기술은 특정 틈새 시장에서의 활용 가능성이 있지만, 대규모 상업화에는 도전이 따를 것입니다. 이러한 점을 고려할 때, 투자에 대한 추천은 보류하며, 시장 진입 전략을 재검토할 필요가 있습니다.

2.2 Patent Analysis #2: patent/US12126458B1/en

Title: Core allocation and power saving for multi-core network processing units ...

Technical Evaluation

Metric	Score	Grade
Originality	0.993	S
Overall Assessment	0.993	Excellent

Market Evaluation

Metric	Score	Assessment
Market Size	0.25	Fair
Growth Potential	0.25	Fair
Commercialization Readiness	0.25	Fair
Overall Market Score	0.75	Good

Application Domains

- Network Processing Units
- Telecommunications
- AI Hardware
- Consumer Electronics
- Automotive

Investment Analysis

- **Investment Recommendation: ■■**
- **Risk Level: ■■**

Overall Assessment (Suitability):

이 특허(patent/US12126458B1/en)는 매우 높은 기술적 독창성을 보유하고 있으며, 이는 혁신적인 NPU 기술의 개발을 통해 차별화된 경쟁력을 제공합니다. 시장성 점수는

양호하나, 시장 규모와 성장 잠재력이 상대적으로 낮아 상업화 준비도가 부족한 점이 아쉽습니다. 그러나 기술적 독창성이 높기 때문에 틈새 시장에서의 성공 가능성이 존재합니다. 따라서, 이 특허는 장기적인 투자 가치가 있으며, 적절한 마케팅 전략과 상업화 노력이 뒷받침된다면 성공적인 결과를 기대할 수 있습니다.

2.3 Patent Analysis #3: patent/KR102799500B1/en

Title: Electronic devices configured to perform inference operations

Technical Evaluation

Metric	Score	Grade
Originality	0.995	S
Overall Assessment	0.995	Excellent

Market Evaluation

Metric	Score	Assessment
Market Size	0.25	Fair
Growth Potential	0.25	Fair
Commercialization Readiness	0.25	Fair
Overall Market Score	0.75	Good

Application Domains

- AI Inference Market
- Neural Processing Units (NPUs)
- Edge Computing
- Consumer Electronics
- Automotive

Investment Analysis

- **Investment Recommendation: ■■**
- **Risk Level: ■■**

Overall Assessment (Suitability):

이 특허(patent/KR102799500B1/en)는 매우 높은 기술적 독창성을 바탕으로 혁신적인 NPU 기술을 제공합니다. 시장성 점수가 우수하나, 시장 규모와 상업화 준비도가 낮아

초기 투자 리스크가 존재합니다. 그러나 기술적 독창성 덕분에 틈새 시장에서의 경쟁력을 확보할 가능성이 높습니다. 따라서 장기적인 관점에서 이 특허는 투자 가치가 있으며, 시장의 성장 가능성을 고려할 때 긍정적인 평가를 받을 수 있습니다. 다만, 상업화 전략을 강화할 필요가 있습니다.

2.4 Patent Analysis #4: patent/KR101997325B1/en

Title: Processor with memory array operable as either last level cache slice or neural ...

Technical Evaluation

Metric	Score	Grade
Originality	0.992	A
Overall Assessment	0.992	Excellent

Market Evaluation

Metric	Score	Assessment
Market Size	0.25	Fair
Growth Potential	0.25	Fair
Commercialization Readiness	0.20	Fair
Overall Market Score	0.70	Good

Application Domains

- Neural Processing Units (NPUs)
- AI Computing
- Edge Computing
- Consumer Electronics
- Automotive

Investment Analysis

- **Investment Recommendation: ■■**
- **Risk Level: ■■**

Overall Assessment (Suitability):

이 특허(patent/KR101997325B1/en)는 매우 높은 기술적 독창성을 지니고 있으며, 이는 혁신적인 NPU 기술로서 차별화된 접근을 보여줍니다. 그러나 시장성 점수가 낮아 시장

규모와 성장 잠재력이 제한적이라는 점은 우려 요소입니다. 상업화 준비도가 낮아 초기 투자 리스크가 존재하지만, AI 및 머신러닝 분야의 지속적인 성장 가능성은 이 기술의 장기적인 생존 가능성을 높일 수 있습니다. 따라서, 기술적 독창성을 바탕으로 틈새 시장을 겨냥한 전략이 필요합니다.

3. COUNTRY COMPARISON

3.1 Country-wise Statistics

Country	Patents	Avg Orig	Avg Market	Avg Suit	Top Grade
United States	2	0.992	0.725	0.858	B (1)
South Korea	2	0.993	0.725	0.862	S (1)

3.2 Country Details

United States
분석 특허: 2개 | 평균 독창성: 0.992 | 평균 시장성: 0.725

South Korea
분석 특허: 2개 | 평균 독창성: 0.993 | 평균 시장성: 0.725

4. TECHNOLOGY GAP ANALYSIS

4.1 Korea's Baseline Scores

Metric	Score
Originality	0.9933
Market	0.7250
Suitability	0.8616

4.2 Technology Gap by Country

Country	Orig Gap	Market Gap	Suit Gap	Overall	Status
United States	-0.0018	+0.0000	-0.0039	-0.0019	Behind

4.3 Strategic Recommendations for Korea

1. 지역 협력 확대

인접 국가들과의 전략적 파트너십을 통해 R&D; 비용을 분담하고 더 큰 시장에 접근할 수 있습니다. 특히 한국이 강점을 보이는 분야에서의 협력 기회를 모색해야 합니다.

3. REFERENCE

3.1 Patent Data Sources

No.	Patent ID	Title
1	patent/US20090257751A1/en	Aggregating Optical Network Device
2	patent/US12126458B1/en	Core allocation and power saving for multi-core network proc...
3	patent/KR102799500B1/en	Electronic devices configured to perform inference operation...
4	patent/KR101997325B1/en	Processor with memory array operable as either last level ca...

3.2 Data Sources and Methodology

- Patent databases: Google Patent
- Market analysis: Industry reports and market research data
- Technology evaluation: Academic papers and technical documentation
- LLM-based analysis: GPT-4 for qualitative assessment

3.3 Key References

[1] Originality Index Methodology

Park, S.Y., & Lee, S.J. (2020). A Study on Derivation Method of Promising Industry-University Cooperation Fields Based on Patents. Ajou University.

[2] AI Semiconductor Market Data

ICT Market Trends by Product Category - AI Semiconductor. Global ICT Portal (2024.09.27)

[3] AI Semiconductor Market Status and Outlook

Korea Eximbank - Overseas Economic Research Institute. Issue Report Vol.2024 (May 2024)

3.4 Report Generation Info

Report Generated	2025-10-23
Technology Domain	NPU
Analysis Method	Multi-Agent AI System
Total Patents Analyzed	4

4. APPENDIX

4.1 Evaluation Methodology

Overall Scoring System

The patent evaluation system uses a multi-dimensional scoring approach combining quantitative metrics and qualitative assessments. Each patent is evaluated across two primary dimensions: Technical Originality and Market Potential.

1. Technical Originality (Originality Index)

This methodology references the Originality Index formula proposed by Park, S.Y. & Lee, S.J. (2020) from Ajou University's research on "A Study on Derivation Method of Promising Industry-University Cooperation Fields Based on Patents".

Formula: Originality = 1 - Σ(NCITED_ik / NCITED_i)²
where:
• NCITED_ik: Number of citations in k-th CPC (Cooperative Patent Classification) class
• NCITED_i: Total citations of patent i
• Score range: 0 to 1 (0 = low diversity, 1 = high diversity)

2. Market Score Calculation

Formula: MarketScore = MarketSize + GrowthPotential + Commercialization

This composite score evaluates the commercial viability across three key dimensions, each normalized to a 0-1 scale.

2.1 Market Size Scoring Criteria (0~0.4)

Score	TAM (Serviceable Market)	Examples
0.35~0.4	$10B+	LLM-based infrastructure $12B, Cloud $18B

0.25~0.35	$3B~$10B	Advanced system memory $5B, Enterprise storage $6B
0.15~0.25	$1B~$3B	Specialized model optimization $1.5B
0.1~0.15	$300M~$1B	Medical imaging NPU $800M
0~0.1	< $300M	Experimental tech, Early POC

2.2 Growth Potential Scoring Criteria (0~0.3)

Score	CAGR / Market Forecast	Examples
0.25~0.3	25%+ / 5yr 2x+	2025: $310M → 2029: $602M
0.2~0.25	20~25%	CAGR 23%, 5yr 1.8x
0.15~0.2	15~20%	17% continuous growth
0.1~0.15	10~15%	CAGR 11%
0~0.1	< 10%	Stagnant or declining

2.3 Commercialization Readiness (0~0.3)

Score	Time to Market	Characteristics
0.25~0.3	< 1 year	Product launch, Mature tech
0.2~0.25	1~2 years	Prototype validation complete
0.15~0.2	2~3 years	Patent filed
0.1~0.15	3~5 years	Early R&D, Standard required
0~0.1	5+ years	Basic research unclear

Grade Classification

Grade	Score Range	Description
S	0.90 - 1.00	Exceptional - Breakthrough innovation with high market potential
A	0.75 - 0.89	Excellent - Strong technical merit and commercial viability
B	0.60 - 0.74	Good - Solid innovation with moderate market potential
C	0.40 - 0.59	Fair - Basic innovation with limited market appeal
D	0.00 - 0.39	Limited - Incremental improvement or unclear market fit

4.2 Multi-Agent Analysis Process

The analysis employs a multi-agent system where specialized AI agents perform different analytical tasks:

Search Agent: Retrieves relevant patent data from multiple databases
Analysis Agent: Evaluates technical originality using NLP and similarity metrics
Market Agent: Assesses commercial potential based on market data and trends
Suitability Agent: Synthesizes scores and generates investment recommendations
Report Agent: Compiles findings into structured analytical reports

4.3 Score Weighting

Component	Weight	Justification
Originality Score	55%	Primary indicator of innovation quality
Market Score	45%	Commercial viability and market readiness

Market Score Breakdown:		
- Market Size	33%	Total addressable market potential
- Growth Potential	33%	Expected market expansion rate
- Commercialization	33%	Technology readiness level

Disclaimer: This report is generated by an AI-powered analysis system and should be used as a reference tool. Investment decisions should be made based on comprehensive due diligence and professional consultation. The scores and grades represent relative assessments within the analyzed patent set and may not reflect absolute market value.