
Efficiency Analysis of Civil Society Organization- Accredited Agricultural Cooperatives in the Cordillera

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Abstract: This study examines the financial performance and relative efficiency of the Civil Society Organization (CSO)–accredited agricultural cooperatives in the Cordillera Administrative Region, Philippines. Using secondary financial data obtained from the Cooperative Development Authority–CAR, the study analyzes 88 cooperatives employing correlation analysis, multiple regression models, and Data Envelopment Analysis (DEA) under a Variable Returns to Scale (VRS), input-oriented framework. Results reveal substantial heterogeneity in cooperative size, revenues, and net surplus. Correlation analysis shows that total assets are very strongly and positively associated with total revenues ($r = 0.964$, $p < 0.01$) and strongly related to net surplus ($r = 0.759$, $p < 0.01$), highlighting the central role of asset base in cooperative financial performance. Regression results further confirm that total assets exert a significant positive influence on both total revenues and net surplus, while total operating expenses exhibit a statistically significant negative effect, indicating inefficiencies arising from excessive input utilization. DEA findings indicate a low mean efficiency score of 0.279, suggesting that cooperatives could achieve current output levels while reducing inputs by approximately 72.1%. Only six cooperatives (7%) were found to be fully efficient, while the majority operated well below the efficiency frontier.

Keywords: efficiency, civil society organization, agricultural cooperative, data envelopment analysis

INTRODUCTION

The International Cooperative Alliance defines cooperatives as self-managed groups which unite members to achieve their economic and social and cultural requirements through member-owned businesses that operate under democratic governance (International Cooperative Alliance, 2016). Cooperatives function as economic organizations which operate as business entities while also serving as community-based social organizations. The organization makes money from its business activities which allows them to fund their member support and community development programs (Food and Agriculture Organization, 2012). The businesses operate as vital components which maintain worldwide economic stability and social fairness because they develop local economic systems which provide financial access to all community members (Ramizo et al.,2024). Agricultural cooperatives allow smallholder farmers to join forces for market entry and productivity enhancement and price stability which creates stronger rural economic bases and supports environmentally friendly development (Tortia et al.,2013; Wanyama et al.,2021). Mozas Moral and Fernández Uclés (2022) demonstrate that agricultural cooperatives play a vital role in supporting rural economic development because these organizations have enrolled 12% of the worldwide population through their three million cooperative members. The cooperatives serve as vital organizations which enable food security achievement through their work to establish social opportunities for smallholder farmers to sustain their farming activities.

The Philippines backs cooperatives through legal systems which it considers vital for achieving national economic development. The legal basis is primarily outlined in Republic Act No. 9520, which amended the original Cooperative Code of the Philippines (RA 6938) and took effect in 2009. The law organizes cooperatives based on their operational purposes including credit services and marketing activities and multipurpose operations while the Cooperative Development Authority must enforce this regulation (Republic of the Philippines, 2009). The 1987 Philippine Constitution supports this argument through its recognition of cooperatives as tools which help create fair economic development (Article XII Section 15). To this end, the government has enacted policies such as the Department of Agriculture's Administrative Order No. 8, Series of 2017; Administrative Order No. 13, Series of 2020; and Administrative Circular No. 03, Series of 2022. The administrative issuances work together to provide agricultural cooperatives with essential resources and financial backing and expert guidance which enables them to support rural development and make government programs at the local level both accessible and effective (Department of Agriculture, 2017, 2020, 2022).

The Cordillera Administrative Region (CAR) depends on cooperatives to sustain its local economic base because these organizations serve the agricultural sector which depends on farming as its main source of income. As of 2022, the Cooperative Development Authority reported 1,348 registered cooperatives in the region, with 133 accredited by the

Department of Agriculture–Regional Field Office CAR (DA-RFO CAR) under its Civil Society Organization (CSO) framework as of November 2024 (Department of Agriculture, 2025). The accredited cooperatives function as vital partners for local development initiatives because they secure improved access to government funding. The situation faces multiple ongoing difficulties which show no signs of resolution. The internal operations of cooperatives struggle with poor governance systems and low member involvement and insufficient financial resources and poor planning methods. The organization faces external challenges which include strong market competition and strict regulations and outdated technology and environmental risks (Vailoces, 2019). The problems they face prevent them from working at maximum capacity while threatening their ability to sustain operations in the future.

Given the government's continued investment in agricultural cooperatives and the critical role they play in rural development, there is an urgent need to evaluate their performance using quantitative methods. Organizations struggle to achieve their best results from existing support systems because they do not have defined performance tracking methods. The research by Coelli et al. (2005) have proposed Data Envelopment Analysis (DEA) as a data-based assessment method to evaluate cooperative efficiency. The research aims to evaluate agricultural cooperative efficiency in the Cordillera Administrative Region for better resource management and policy development and support system enhancement. The research results will help cooperative leaders and government agencies and other stakeholders because they will discover optimal methods and reveal necessary enhancements which will lead to sustainable cooperative development that includes all members.

REVIEW OF RELATED LITERATURE

The fundamental principle of cooperatives requires members to collaborate through cooperative work for reaching their common objectives. According to Schmidt (1991), cooperative work involves people coordinating their efforts within the same or connected production processes. The concept demonstrates that people can perform challenging tasks which they cannot handle by themselves when they work together. Members of cooperatives work together through their combined work effort and shared resources and collective decision-making process to achieve better economic and social conditions.

The International Co-operative Alliance (ICA) established the 2015 principles of cooperatives which form the basis for all cooperative organizations to operate throughout the world. The principles require members to join voluntarily while maintaining open membership status which guarantees equal treatment for all members without any form of discrimination. The cooperative operates through democratic member control which gives every member equal voting power. The cooperative structure enables members to participate equally in financial decisions through member economic participation. The authors explain

that cooperatives need to maintain their independence from outside control to achieve their desired outcomes. The organization provides members with educational programs which teach them how to participate effectively by giving them essential knowledge. The cooperative system unites its members through their organizations which maintain mutual support between each other. The cooperative organization shows its commitment to sustainable development through its social responsibility programs which serve the community.

The research bases its foundation on the Resource-Based View (RBV) of strategic management which demonstrates that organizations need their internal resources to gain and maintain market leadership. The RBV functions as a theoretical framework which enables organizations to discover their unique resources and capabilities for conducting strategic analysis to develop competitive advantage. The theory explains that resources function as essential organizational components which help organizations execute their operations effectively while dealing with external market forces. RBV stands out because it shows how resources function as strategic elements which create competitive advantage through their internal assets (Barney, 1991; Madhani, 2010).

Organizations need efficiency evaluation to achieve their performance targets and maintain their ability to operate successfully in the future. Organizations operating in competitive markets need to evaluate their operational efficiency because better performance directly leads to improved financial results according to established research (Coelli et al., 2005). Organizations use efficiency measurement to evaluate their performance which enables them to assess their capacity for generating maximum results from their existing resources.

The theoretical framework for efficiency analysis derives from economic theories and operational research techniques. Koopmans (1951) established technical efficiency through his definition which states that an input-output vector becomes efficient only when no input reduction or output expansion can be made without causing any input or output to deteriorate. Farrell (1957) created a quantitative system which enables production efficiency assessment by measuring output against production boundary constraints. The Data Envelopment Analysis (DEA) method first appeared in Charnes Cooper and Rhodes (1978) when they applied linear programming to develop a nonparametric evaluation system which compared Decision Making Units (DMUs) through relative performance assessment.

The Data Envelopment Analysis (DEA) framework contains the Charnes, Cooper and Rhodes (CCR) model which serves as the initial official model for assessing decision-making unit (DMU) efficiency. The CCR model which Charnes Cooper and Rhodes (1978) developed uses output-weighted sums to determine efficiency through division by input-weighted sums to achieve maximum efficiency scores for each DMU. This is subject to the condition that no DMU using the same set of weights can exceed an efficiency score of one.

The scoring system shows that units which reach this mark operate on the efficient frontier thus they are considered efficient but units that perform below the frontier receive scores ranging from 0 to 1 which shows their inefficient performance (Thanassoulis, 2001).

Kuswanto (2024) conducted an efficiency analysis of 34 secondary cooperatives in Indonesia at the provincial level from 2019 to 2021. The research used total assets together with operating expenses and number of employees as input data while total revenue and surplus (profit) served as output variables. The DEA results showed that most cooperatives worked at levels below their best performance because they used too many resources without getting enough value from them which proved the need for better resource management approaches.

In a similar context, Siregar et. al. (2016) applied Data Envelopment Analysis (DEA) to measure the efficiency of 32 Village Unit Cooperatives (KUD) in Indonesia from 2011 to 2012. The researchers used employee numbers and operational expenses and total asset values as their input variables while sales revenue and member service numbers and loan distribution amounts served as their output variables. The research indicated that pure technical efficiency reached its highest point but scale inefficiencies emerged because the cooperatives provided rice milling and electricity distribution services.

DESIGN AND METHODOLOGY

Research Design

This study employed a quantitative research design specifically survey method to evaluate the efficiency of Civil Society Organization–accredited agricultural cooperatives in the Cordillera Administrative Region. Babbie (2010) explains that quantitative research methods use statistical and mathematical techniques to study numerical data which researchers obtain through their investigations. The research methods use objective measurement techniques which include surveys and questionnaires and existing datasets to study specific phenomena through relationship analysis and generalization. The research method applies to this study because it used numerical data which came from financial statements of cooperatives that the Cooperative Development Authority (CDA) provided.

Locale and Population of the Study

The study covered the six (6) provinces of the Cordillera Administrative Region (CAR), namely Benguet, Mountain Province, Apayao, Kalinga, Ifugao, and Abra. According to the Department of Agriculture – Regional Field Office CAR (DA-RFO-CAR), there were 133 agricultural cooperatives accredited as Civil Society Organizations (CSOs) as of November 2024. These cooperatives served as the sources of secondary data for the study. However, out of the 133 cooperatives, only 89 had complete datasets available from the

Cooperative Development Authority (CDA). These 89 agricultural cooperatives with complete datasets served as the secondary data for the analysis.

The agricultural cooperatives included in the study met the specific criteria to ensure the reliability and relevance of the data collected. First, each cooperative was accredited as a Civil Society Organization (CSO) by the Department of Agriculture (DA) and complied with the requirement of submitting audited annual financial statements to the Cooperative Development Authority (CDA). In addition, the cooperatives have received direct support from the DA and have been actively involved in DA programs for a minimum of three years. Lastly, the cooperative must have been operational for at least three years to ensure the availability of sufficient performance data for analysis.

Data Gathering Tool

The study utilized both secondary and primary data gathering tools to ensure information for the efficiency analysis of agricultural cooperatives in the Cordillera Administrative Region (CAR).

The secondary data were obtained from the audited financial statements of agricultural cooperatives submitted to the Cooperative Development Authority (CDA). These financial reports contained essential variables required for the Data Envelopment Analysis (DEA), including total assets, total operating expenses, total revenue, and total net surplus.

Data Gathering Procedure

The data gathering procedure for this study began with the submission of the research proposal to the Ethics Committee for ethics review and approval. After approval, a request letter with official permission to use the data for research purposes signed by the researcher and noted by the adviser was sent to the Cooperative Development Authority (CDA) to obtain the needed secondary data. The data collected was then organized and screened for completeness in Excel format. Cooperatives with no data, missing values for the required variables and did not meet the criteria were excluded. This resulted in a final set of 88 cooperatives with complete datasets for analysis.

Treatment of Data

First, the secondary data obtained from the financial statement of agricultural cooperatives obtained from CDA were analyzed using correlation and regression analysis. Correlational analysis was conducted to examine the relationships between the key financial variables such as total operating expenses, total assets, total revenue, total net surplus and to confirm the suitability of the chosen inputs and outputs for DEA. In addition, regression analysis was utilized to investigate how operating expenses and assets impact revenues and then operating expenses and assets to net surplus while controlling for other relevant factors.

Thus, two regression models were analyzed using the following formula (Gujarati and Porter, 2009):

$$\text{Total Revenue}_i = \beta_0 + \beta_1(\text{Total Operating Expenses}_i) + \beta_2(\text{Total Assets}_i) + \varepsilon_i$$

where:

Total Revenue_i = Dependent variable

β_0 = Intercept term

β_1 = Operating expenses

β_2 = Total assets

ε_i = Error term

i = Index of each cooperative

$$\text{Net Surplus}_i = \beta_0 + \beta_1(\text{Total Operating Expenses}_i) + \beta_2(\text{Total Assets}_i) + \varepsilon_i$$

where:

Net Surplus_i = Dependent variable

β_0 = Intercept term

β_1 = Operating expenses

β_2 = Total assets

ε_i = Error term

i = Index of each cooperative

To ensure comparability across cooperatives of different scales, the numerical variables were normalized using the min–max scaling technique using the formula (Joseph and Kartheeban, 2025):

$$X = \frac{X - X_{\min}}{X_{\max} - X_{\min}}$$

where:

X = original value

X_{\min} = minimum value in the dataset

X_{\max} = maximum value in the dataset

X' = normalized (scaled) value

Second, the normalized data were then subjected to Data Envelopment Analysis (DEA) using the Banker, Charnes, and Cooper (BCC) Model which operates under the assumption of Variable Returns to Scale (VRS) and input orientation. This model was chosen to evaluate how efficiently cooperatives utilize their available resources taking into account potential scale inefficiencies. The analysis was carried out using the OlineOutput DEA Software, web-based Data Envelopment Analysis (DEA) solver with full access features which implements standard DEA models based on the formulations of Charnes, Cooper, and Rhodes (1978) and Banker, Charnes, and Cooper (1984). The web-based solver was selected

for its accessibility, accuracy, and ability to generate efficiency scores, reference sets, and lambda values consistent with established DEA methodologies. The basic DEA formula for the input-oriented model based on Charnes, Cooper, and Rhodes (1978) is as follows:

Maximize θ

subject to:

$$\sum_{i=1}^k u_i x_i \leq \theta \sum_{i=1}^k u_i x_i^0$$

$$\sum_{j=1}^n v_j y_j \leq 1$$

where:

θ denotes the efficiency score of the DMU being assessed.

u_i represents the weight of the i th input.

x_i denotes the values of the i th input utilized by the DMU being assessed.

x_i^0 represents the value of the i th input employed by the most effective DMU.

v_j denotes the weight of the j th output.

y_j represents the value of the j th output obtained from the DMU being assessed.

k denotes the number of inputs.

n represents the number of outputs

DISCUSSIONS

The financial performance data of CSO accredited cooperatives in the Cordillera appears in Table 3 which shows their operating expenses and assets and revenues and net surplus. This were requested from the Cooperative Development Authority (CDA)- CAR. The research data included numerical statistics which described each cooperative organization. It reveals a wide variation among cooperatives in terms of financial size and surplus. The net surplus percentage of total revenue shows wide differences because organizations in the region use different management approaches and operational frameworks.

Table 1. Variable correlation analysis

	Total Operating Expenses	Total Assets	Total Revenues	Net Surplus
Total Operating Expenses	1			
Total Assets	0.701**	1		
Total Revenues	0.614** (SC)	0.964** (VSC)	1	
Net Surplus	0.218* (WC)	0.759** (SC)	0.841**	1

Legend: ** - highly significant	* - significant	ns – not significant
± 1.00	Perfect Correlation (PC)	
± 0.81 – ± 0.99	Very Strong Correlation (VSC)	
± 0.61 – ± 0.80	Strong Correlation (SC)	
± 0.41 – ± 0.60	Moderately Strong Correlation (MSC)	
± 0.21 – ± 0.40	Weak Correlation (WC)	
± 0.01 – ± 0.20	Very Weak Correlation (VWC)	
0.0	Negligible Correlation (NC)	

The research findings about Total Operating Expenses and Total Assets and Total Revenues and Net Surplus of CSO-accredited cooperatives in the Cordillera region appear in Table 4. Results revealed that Total Revenues have a highly significant and very strong positive correlation with Total Assets ($r = 0.964$, $p < 0.01$) and a strong positive correlation with Total Operating Expenses ($r = 0.614$, $p < 0.01$). The financial data shows Net Surplus maintains a strong link with Total Assets because the correlation coefficient reaches 0.759 ($p < 0.01$) and Total Revenues show a weak connection with Total Operating Expenses through correlation coefficients of 0.841 ($p < 0.01$) and 0.218 ($p < 0.05$) respectively.

The data indicates that cooperatives with larger asset values will produce higher revenue and net surplus because their size enables them to achieve superior financial performance and sustainability. The analysis shows that Total Operating Expenses and Net Surplus have a weak relationship but the results demonstrate statistical significance at a p value less than 0.05. The data shows operating expenses impact cooperative net surplus but their impact remains restricted to a specific degree.

The research indicates that cooperatives which possess greater assets generate higher revenue and net surplus amounts which results in improved financial stability for their operations. The relationship between Total Revenues and Total Assets shows a strong connection because their correlation coefficient reaches 0.964. The company achieves revenue growth through its asset investment activities. The relationship between revenues and Total Operating Expenses shows a moderate connection because expenses rise when earnings increase ($r = 0.614$). The relationship between expenses and net surplus exists at a weak level but shows statistical significance ($r = 0.218$) which demonstrates that effective expense management results in profitability.

Table 2. Regression coefficients on the relationship between Total Operating Expenses and Total Assets to Total Revenues

	Unstandardized Coefficients		Standardized Coeff.	t	Sig.
	B	Std. Error	Beta		
Constant	655915.51	1265843.39		0.518	0.606
Total Operating Expenses	-0.022	0.007	-0.122	-3.187	0.002
Total Assets	0.123	0.004	1.049	27.510	0.000

Dependent Variable: Total Revenue

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.968 ^a	0.936	0.935	11420783.99

Predictors: (Constant), Total Assets, Total Operating Expenses
Dependent Variable: Total Revenue

Table 3. ANOVA table on the relationship between Total Operating Expenses and Total Assets to Total Revenues

	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.652E+17	2	8.259E+16	633.17	0.000 ^b
Residual	1.122E+16	86	1.304E+14		
Total	1.764E+17	88			

Dependent Variable: Total Revenue

Predictors: (Constant), Total Assets, Total Operating Expenses

The analysis in Table 5 employs regression methods to investigate how Total Operating Expenses and Total Assets affect Total Revenues. The model yielded a high coefficient of determination (Adjusted R² = 0.935), indicating that 93.5% of the variance in Total Revenues is explained by these two predictors combined.

The research data indicates Total Assets ($\beta = 1.049$, $p = 0.000$) serves as the primary positive factor which shows businesses with bigger total assets will experience substantial revenue expansion. Total Operating Expenses ($\beta = -0.122$, $p = 0.002$) showed a significant negative relationship which indicates that increased operational costs do not lead to better revenue performance.

The ANOVA results ($F = 633.17, p < 0.001$) presented in Table 6 show that the entire regression model reaches statistical significance because Total Assets and Total Operating Expenses together create a significant relationship with Total Revenues. The model shows strong reliability because the probability of these results happening randomly is lower than 0.1%.

Table 7 further shows the regression model relating Total Operating Expenses and Total Assets to Net Surplus. The model demonstrated an Adjusted R^2 of 0.765, signifying that 76.5% of the variation in Net Surplus is accounted for by the independent variables.

Table 4. Regression coefficients on the relationship between Total Operating Expenses and Total Assets to Net Surplus

	Unstandardized Coefficients		Standardized Coeff. Beta	t	Sig.
	B	Std. Error			
Constant	1389936.826	501626.167		2.771	0.007
Total Operating Expenses	-0.024	0.003	-0.618	-8.537	0.000
Total Assets	0.029	0.002	1.192	16.468	0.000

Dependent Variable: Net Surplus

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.878 ^a	0.771	0.765	4525807.963

Predictors: (Constant), Total Assets, Total Operating Expenses
Dependent Variable: Net Surplus

Table 5. ANOVA table on the relationship between Total Operating Expenses and Total Assets to Net Surplus

	Sum of Squares	df	Mean Square	F	Sig.
Regression	5.919E+15	2	2.959E+15	144.481	0.000 ^b
Residual	1.762E+15	86	2.048E+13		
Total	7.680E+15	88			

Dependent Variable: Net Surplus

Predictors: (Constant), Total Assets, Total Operating Expenses

The results indicate that Total Assets ($\beta = 1.192, p = 0.000$) have a strong positive and significant influence on Net Surplus, suggesting that asset expansion contributes directly

to improved cooperative profitability. On the other hand, Total Operating Expenses ($\beta = -0.618, p = 0.000$) had a significant negative coefficient, showing that excessive operational costs reduce net surplus levels.

The ANOVA test presented in table 8 also supports the statistical validity of this model ($F = 633.17, p < 0.001$), verifying that the combination of Total Assets and Total Operating Expenses significantly predicts Net Surplus. This confirms that the regression equation provides a reliable explanation of cooperatives' profitability performance.

Table 6. Distribution of cooperatives in the Cordillera, by efficiency level

Efficiency Classification	Quantity	Percentage
Fully Efficient (1.0)	6	7
Slightly efficient (0.99-0.6)	8	9
Moderately efficient (0.59-0.01)	74	84
Fully Inefficient (0)	0	0
Total	88	100
Minimum Efficiency Score		0.017
Mean		0.279

According to the calculation outcome of the efficiency score, only 6 cooperatives (8%) out of the 89 cooperatives analyzed achieved a fully efficient score of 1.0. The organizations have achieved their peak operational efficiency according to the data. The cooperatives achieve their highest possible output through their current resource utilization of operating expenses and total assets which produces maximum revenue and net surplus. This pattern is consistent with Sebhatu et al. (The research by Gebresenbet (2013) analyzed 329 rural savings and credit cooperatives in Tigray region of Ethiopia to discover that 18 cooperatives (5.5%) reached the highest DEA efficiency score of 1.0 but all other cooperatives operated below the efficiency frontier which showed major inefficiencies in their resource management.

The research showed that 8 cooperatives (8.99%) demonstrated low efficiency because their efficiency scores fell between 0.99 and 0.60. The group operates near the efficiency frontier yet it has opportunities to enhance its performance through better input management and output optimization. The organization operates at a level which is less than its most efficient point because its Efficiency} rating stands at 1.00. The organization needs to create particular programs which either decrease its operational costs or enhance its productivity output to achieve successful results. The group needs to optimize its performance through two main improvements which focus on financial management and scale optimization.

The research data included 74 cooperatives which made up 83.15% of the sample and showed average operational efficiency through their efficiency scores between 0.59 and 0.01. The high percentage shows that most cooperatives in this area maintain suboptimal operational levels. The performance gap shows that poor resource management leads to operational difficulties because it causes higher operational expenses and dormant equipment and insufficient money for new product development and revenue growth. The collected data shows evidence of three main obstacles which impact management abilities and technological adoption and business growth potential. Xaba Marwa and Mathur-Helm (2018) studied agricultural cooperatives in Mpumalanga South Africa and discovered that their technical efficiency scores reached only 68% which showed most cooperatives operated beneath the efficiency boundary. The researchers established that subpar results stem from insufficient resource handling and insufficient managerial expertise which needs better financial monitoring and better technology and improved management approaches to achieve better cooperative performance and financial success.

CONCLUSION

1. The research findings from correlation and regression analysis showed that total assets directly relate to higher total revenue and net surplus because cooperatives with bigger asset bases achieve better financial performance. The operating expenses showed a direct negative relationship with both outcome variables which proves that increased spending does not result in improved financial performance.

2. The Data Envelopment Analysis (DEA) results showed that cooperatives operated at 27.9% efficiency because their average efficiency score reached 0.279. The research results show that most cooperatives run their operations at levels which fall short of maximum efficiency because they use their assets and expenses at excessive rates thus requiring better resource management to achieve better operational performance.

RECOMMENDATION

The following recommendations were formed based on the results and discussion:

1. The cooperatives need to concentrate on asset management through regular asset audits which will enable them to create investment strategies for revenue-generating assets that support their operational requirements. The organization needs to establish cost control systems which include annual operating budget creation and scheduled expense comparison between actual and projected amounts and financial tracking systems that combine scheduled performance assessments with internal audit procedures to achieve proper management of operational costs.

2. The Cooperative Development Authority (CDA) needs to establish Data Envelopment Analysis (DEA) as its permanent performance tracking system because it

supports its mission to enhance cooperative operational efficiency and promote good governance. The CDA will perform regular efficiency evaluations through cooperative data which members need to submit to State Universities and Colleges (SUCs) and cooperative federations and Department of Agriculture and other relevant agencies. The management of cooperatives which achieve low efficiency scores needs to use benchmarking against efficient cooperatives to create particular plans for resource optimization and productivity enhancement which will be monitored through upcoming DEA performance evaluations.

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