# Annotation Guideline for Relations between Method Entities and Scientific Papers

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## 1. Introduction

These guidelines outline an annotation scheme for **R**elations between **M**ethod entities and scientific **P**apers (R(p,m) for short).

The method entity is a collective term representing all means or ways for solving scientific tasks, typically expressed as nouns or noun phrases. In the paper, the method entity encompasses various subcategories such as algorithm, model, method, strategy, scheme, framework, function, technique, system, etc.

There are many method entities scattered in unstructured scientific text. For example, some may be well-designed for solving the main task and elaborated on in details in the Methodology section, while others are merely mentioned in the Related Work section. Thus, R(p,m) varies among method entities within a paper. We meticulously define a five-categories R(p,m) classification scheme which fully describes all of the relations between method entities and scientific papers.

In order to eliminate as much ambiguity as possible and obtain a standard annotation workflow, we have developed this annotation guideline. In this guideline, we mainly consider two level questions: (1) what is the general representation of a method entity, and (2) what is the relationship of the method entity to the paper, i.e., why is the author mentioning the method entity.

## 2. R(p,m) classification scheme

| Relation | Definition | Example |
|---|---|---|
| **Propose** | Method entity is the original method proposed by the paper to solve the main problem studied in the paper. It is unique and innovative, can reflect the core contribution | In this paper, we propose a novel convolutional neural network framework for the characteristics of hyperspectral |

| | | |
|---|---|---|
| | of the paper, and has the closest semantic correlation with the paper. | image data called **HSI-CNN.** |
| **Improve** | An existing method that has been improved and used in the research. The "improve" relationship shows the growth potential and research vitality of the existing methods, and can reflect the evolution process of the method entities. | Firstly, **SSA** is improved by the opposition-based learning (OBL), cosine inertia weights and Levy flight strategy. |
| **Use** | Method entity is the existing method directly used to solve the research problem. The use relationship is a direct reflection of the influence of existing methods, and can make up for the errors in the measurement of the influence of method entities caused by irregular reference to a certain extent. | Specifically, we use a **shared meta-network** to capture the meta-knowledge of semantic composition and generate the parameters of the task specific semantic composition models. |
| **Compare** | Method entities are mentioned in the paper for comparison to reflect the shortcomings of existing methods or to demonstrate the advantages and characteristics of new methods. The "compare" relation shows the collision between existing methods and new methods or new ideas, which can predict the direction of the evolution and updating of methods. | We further compare three traditional optimization algorithms, namely, **RDP-SGD**, **RDP-Adagrad**, and **RDP-Adam**. |
| **Mention** | Method entities are introduced or mentioned in the paper, but are not directly used to solve the research problem. The method entity may be the object of the review or the basis for the discussion, but it is not directly used to solve the main problem of the research. | The **goal net model** has been successfully applied in many agents, specially, non-player-character agents in computer games. |

# 3. General Form of Method Entities

The most basic characteristics of a method entity are:

- concise as well as information-rich,
- referring uniquely and definitively to a specific method.

Therefore, it is essential to distinguish method entities from other types of entities, such as theoretical entities, problem entities, etc.

Secondly, "method-like" phrases that lack practical meaning need to be excluded, for example, "two-phase method."

Next, for candidate method terms, we should aim to eliminate unnecessary components and capture only the core aspects that express a method.

Below, we summarize some common mistakes for non-method entities or non-canonical form method entities:

(1) “adj. + method”

Such phrases do not clearly indicate a method and lack practical meaning; therefore, they are not considered as method entities.

For example: "two-step method," "two-phase method," "unified model," "hybrid method," "enhanced modules," and "top-down method."

(2) Non-noun term

Such expression describes an operation/step/process rather than a method and is not a noun phrase entity, so it does not qualify as a method entity.

For example: "by measuring local geometric distortions and global sharpness."

(3) Superfluous modifiers

To maintain the conciseness of method entities, we need to exclude some unnecessary modifiers, such as adjectives, quantifiers, prepositional phrases, etc.

For example, in "An Efficient Spatial Feature Fusion Algorithm for Improving Haze-Corrected CS Pansharpening," the terms "An" (quantifier), "Efficient" (adjective), and "for Improving Haze-Corrected CS Pansharpening" (prepositional phrase) should be excluded.

# 4. Basic patterns and circumstances for 5-R(p,m)

Color Explanation: propose | use | improve | compare | mention

## 4.1 Propose

We propose/present/introduce/design XXX

XXX is proposed/presented

Our code is publicly available at https://.../ XXX

## 4.2 Improve

### 4.2.1 Extends the application scenario, input data/features, parameters, etc., of a method

This paper applies learning algorithm into goal selection in dynamic environments

We intend to develop a general approach for generally boosting FSL via exploiting such prior knowledge in the feature learning phase

The original recommender model is endowed with more representation capacity by possessing more functional model parameters

### 4.2.2 The method itself has been restructured / optimized / modified / improved

We modify the discrete bilinear form following the idea of variational multiscale method

The change map is obtained by the improved Markov random field

We also factorize the 3D convolution to reduce the training parameters and enhance network efficiency

### 4.2.3 Extend and improve existing models by introducing new components/mechanisms, etc

We adopt the state-space representation of a Gaussian process to recast the nonlinear latent force model

Following the proposed framework, a new semisupervised FS (SSFS) method is derived and studied in depth

By plugging GSTO into HRNet, we get a more powerful backbone

### 4.2.4 New variants of existing models are formed

we investigate a new variant of neural architecture search (NAS) paradigm - searching with random labels

We study two variants of this scheme, Fed-ZDAC (federated learning with zero-shot data augmentation at the clients) and Fed-ZDAS

(federated learning with zero-shot data augmentation at the server)

4.3 Use

We use/apply/employ/utilize/adopt/choose XXX

XXX is applied/employed/adopted

4.4 Compare

Comparing to XXX

Our method outperforms XXX

4.5 Mention

4.5.1 Background Introduction

XXX has been used in ⋯

Recently, XXX ⋯

4.5.2 Conduct a review/analysis

We conducted analysis of the two approaches: XXX-1 and XXX-2.

We analyzed the drawback of XXX.

The performance of different kinds of XXX is analyzed

4.5.3 Applicability/possibility/advantage statement

Our scheme is suitable for XXX-1 and XXX-2.

The proposed method can be easily grafted into XXX framework.

Our method is flexible to be integrated into XXX architectures