Mentoring Advice on Nomination for IEEE Fellow

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This document offers advice to colleagues who are interested in becoming an IEEE Fellow. The main purpose is to encourage greater consistency in the preparation of nominations, so that rankings might more easily reflect real differences in candidates' accomplishments rather than differences in effort put into nominations. The advice about the nomination package should be reasonably general across technical areas within the IEEE. The advice about the level of citations that should make a person competitive for IEEE Fellow may be more specific to the pattern recognition, computer vision, image processing and biometrics areas. Only the quotes from the IEEE web pages are official IEEE information. Everything else is my own view on the IEEE Fellow process, based on my own experience and discussions with colleagues.

Why IEEE Fellow Is An Honor.

IEEE Fellow is prestigious and coveted honor. One reason for this is that there is a limit on how many people can be elevated to IEEE Fellow in a given year. As stated on the IEEE web site, "*According to IEEE Bylaw I-305.5, the total number of Fellow recommendations in any one-year must not exceed one-tenth of one percent of the voting membership on record as of 31 December of the year preceding.*"[1] Thus, IEEE Fellow is a 1-in-1,000 honor among the IEEE membership each year. Many excellent, highly-regarded researchers are not advanced to IEEE Fellow on their first nomination. Indeed, many excellent, highly-regarded researchers are never even nominated simply because they are not IEEE members.

Another reason that IEEE Fellow is an honor is that the nominations are, in general, carefully and rigorously reviewed. There are two stages of formal review. The typical first stage is at the level of the IEEE Society or Council that the nominee identifies as their technical home. The second stage is an IEEE-wide level of evaluation. At both stages, nominees are reviewed and competitively ranked.

Note that in some professional societies in technical areas other than electrical engineering and computer science, there is no limit on how many persons can be advanced to Fellow rank. In those areas, being advanced to Fellow is not considered such a big deal. Colleagues coming from such an area may initially be unaware of the difference in status between being a Fellow of the IEEE versus a Fellow of their own home professional society.

The IEEE Fellow Nomination and Evaluation Process.

The first step in becoming an IEEE Fellow is the nomination package. Eligibility to be nominated is described as follows on the IEEE web site.

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[1] http://www.ieee.org/membership_services/membership/fellows/steps.html

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At the time the nomination is submitted, a nominee must:
- *have accomplishments that have contributed importantly to the advancement or application of engineering, science and technology, bringing the realization of significant value to society;*
- *hold <u>IEEE Senior Member or IEEE Life Senior Member grade;</u>*
- *have been a member in good standing in any grade for a period of five years or more preceding 1 January of the year of elevation.*

The nomination package requires: having a nominator, deciding on the nominee's most important technical contributions and how to present their importance in a clear and concise manner, having eight persons who are already IEEE Fellows who will write references for the nomination, having at least one and ideally three Endorsers for the nomination, and deciding on the Society or Council that will do the initial evaluation. More is said about each of these below.

The first round of review and ranking takes place at the Society / Council level. Each Society or Council has a Fellow Committee that evaluates the nominations that come to it. Nominations are ranked on a numerical scale of 1 to 100, with specific ranges labeled with terms such as "Highly Competitive", "Competitive", "Not Competitive". At this level, the 1-in-1,000 numerical limit does not play a large role. An important detail of the evaluation at this level is that the committee **does not** see the References but **does** see the Endorsements. I have heard the view expressed that the Endorsements are not an important part of the Nomination. However, if there are two otherwise equally qualified Nominations before the committee, it is easy to imagine that a Nomination with Endorsements will get ranked ahead of one with no Endorsements. Also, if the area covered by the Society / Council is broad enough that the Committee may not be familiar with all of the sub-areas, an Endorsements may help to validate the importance and impact of the nominee's accomplishments. For this reason, it is useful to have at least one Endorsement.

The second round of review and ranking takes place at the IEEE level. The IEEE web site describes this review and ranking process as follows.

> *All nomination materials are forwarded in confidence to the IEEE Fellow Committee. The IEEE Fellow Committee consists of 52 members, all of whom are IEEE Fellows with expertise in the technical areas represented by IEEE societies/technical councils and selected to represent the ten IEEE Regions. The IEEE Fellow Committee recommends nominees to the IEEE Board of Directors, according to the following criteria.*
> - *significant contributions as Application Engineer/Practitioner, Educator, Research Engineer/Scientist, or Technical Leader;*
> - *evidence of technical accomplishments;*
> - *evaluation by the IEEE Society/Technical Council selected by the nominator;*
> - *confidential opinions of references and endorsers;*
> - *service to other professional engineering societies;*
> - *total years in the profession.*
> *Each nominee is rated numerically on the basis of this information.*

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The Nomination Package.

Item 5 on the nomination form is the Nominator. The nominator should be someone who is senior and highly regarded in the nominee's technical area. Ideally, it would be someone who is also widely known across the IEEE. At the level of the IEEE-wide evaluation, it can help if the members of that committee know of and respect the nominator's accomplishments. In general, the nominator should have some "arm's length" quality from the nominee. That is, the nomination may be seen as more objective if the nominator is not the nominee's PhD advisor, or someone from the nominee's institution. If there are two approximately equally qualified nominees and only one can go forward, it should not be surprising if the nomination that seems more objective / impartial is the one to go forward.

Item 6 is "Individual Contributions". Part (a) asks for a description of the nominator's relation to the candidate and how the nominator knows about the importance of the nominee's accomplishments. It is important that the nominator can make specific comments about specific elements of the nominee's work. Part (b) asks, "Explain how the nominee's one or two most distinctive contributions have contributed to the advancement or application of engineering, science and technology." Most nominees have done many things by the time they become nominees, and so there is a degree of selection in deciding which achievements to build the nomination around. Obviously, the contributions listed should be ones that have clearly documentable impact (citations, prizes, awards, licenses, products, etc). The contributions listed should also be ones for which the nominee is seen as the prime mover. Large projects in industry where the nominee was not a leader of the project are difficult to make the case for. In academia, projects done with your PhD advisor are difficult to make the case for. Ideally, the contributions also tie in to a topic that is currently "hot" or "fashionable". As the committee considers nominations, if there two roughly equally ranked nominees and only one can go forward, it should not be surprising if the one whose accomplishments are in an area that has been in the news in the past year is the one that goes forward.

Item 7 is "Evidence of Technical Accomplishment", and has two parts. Part 1 says "List the three most important items of tangible and verifiable evidence of technical accomplishments identified in section 6b …." This is often three related and highly-cited papers. A patent or design for some important process or product might be listed. Much less common, an element of essential technical service in an important public program might be listed. In general, the three items listed here are related technically, and are chosen to give clear support to the contributions mentioned in item 6. Part 2 says "List not more than 10 additional items, subdivided into distinct areas of contributions." This is quite often a list of ten highly-cited papers, but designs, patents, software releases and other items may be part of the list. With each item in Part 1 and 2, a few sentences of narrative is given to explain the "significance and impact" of the contributions. Again, this narrative should be constructed so that section 7 overall gives evidence of the impact of technical accomplishment that substantiates the contributions mentioned in item 6.

Item 8 is a list of "IEEE Activities" and item 9 is a list of "Non-IEEE Activities". The IEEE Activities typically include service on IEEE conference program committees, service as Associate Editor for IEEE journals, and service as an officer in Technical Committees, Councils or Societies. While the exact content of this item is perhaps not as important as that in items 6

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and 7, I can't recall ever seeing an empty or near-empty section 8.a in a successful nomination. Item 9 typically lists similar types of things, for non-IEEE conferences, journals and societies.

Item 10 is a list of up to 8 References, each of whom is already an IEEE Fellow. The references should be people who are well known and who are also already familiar with the nominee's work. References who have to learn about the nominee's work to write the reference are less likely to be able to write the detailed, positive reference that is needed. A minimum of 5 references is required, but in practice it is best to have all 8 allowed references. If a committee is considering two otherwise equally qualified nominees, but one has the minimum 5 references and the other has 8 references, it should not be surprising if the one with eight references gets ranked higher.

Item 11 is an optional list of up to 3 Endorsements. I have seen successful nominations with no Endorsements. But it is common for nominations to have one or more Endorsements. An Endorsement might be made, for example, by the EIC of a journal that nominee has been an AE for, a Society officer that the nominee has been a conference organizer for, a lead scientist of a government organization or company whose activity has been impacted by the nominee's work, or simply a well-known senior researcher in the nominee's area.

Item 12 is the name of the IEEE Society / Council that will evaluate the nomination. It potentially can make a difference which Society / Council evaluates a nomination. In my own experience, the level of effort made by a given Society or Council to identify qualified nominees and organize well-prepared nominations can vary from year to year. But this is something that is difficult to strategize ahead of time, as it may depend on how many nominations that Society / Council receives this year, how many successful nominations in had last year, who is on its evaluation committee, etc. I have heard the view expressed that there is a per-Society "quota" on successful Fellow nominations, based on each Society's relative fraction of IEEE membership. Colleagues more involved with the process than I am assure me that there is in fact **not** a quota. However, I am told that Societies' do look at the fraction of their nominations that are successful in a given year, in comparison to the fraction overall for the IEEE, as part of evaluating how well the Fellow nomination and evaluation process us working in their society.

What Makes A Competitive Nomination.

I am personally familiar with ten nominations in the most recent cycle. Eight were for nominees in academia, and two in industry. Two were for nominees outside of the US and eight inside the US. One was for a female nominee and nine for males. Four of the ten nominations were successful. Looking at different dimensions: one of the two from industry was successful, one of the two from outside of the US was successful, the one female nominee was successful, and two of six from academia in the US were successful.

The four successful nominees had their most-cited paper on Google Scholar with 800+, 1,000+, 3,000+ and 5,000+ citations. They also had from 9 to 18 additional papers with 100+ citations. In contrast, of the six nominees that were not successful, only one had a most-cited paper at more than 600 cites, and none had more than 12 papers with 100+ cites. A citations-based rule that would almost cleanly separate the two groups is: "To be a competitive candidate for IEEE Fellow, you should have at least one paper with 1,000+ citations, and overall at least ten papers with 100+ citations". The specific numbers in such a rule might, of course, be

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different for an area other than pattern recognition / computer vision / biometrics. However, the idea that there is a range of easily documented impact that makes a nomination competitive is likely true in all areas. Before undertaking the large effort necessary to prepare a Fellow nomination, it might be worthwhile to make a comparison to recent Fellows in the same general technical area.

The number of years since PhD was largely the same between nominations that were and were not successful. Similarly, for those in academia, the number of years since becoming full Professor was largely the same between nominations that were and were not successful. These observations reinforce the idea that Fellow is not earned by longevity or years in service.

Subjectively, it appears to help if the contributions emphasized in the nomination are in an area that is currently hot, fashionable, or in the news. It also seems to help if the nominee is still working in the area of the contributions that are emphasized in the nomination.

Colleagues who have been more involved with the Fellow selection process than I have tell me that while in the past there may have been some bias in favor of advancing nominations from industry and from outside of the United States, that this is much less of an influence currently.